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Denver
Colorado



Watershed Plan and Environmental Assessment

Shavano Valley Watershed
Montrose County, Colorado



JULY 1986

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SHAVANO VALLEY WATERSHED
MONTROSE COUNTY, COLORADO

WATERSHED PLAN AND ENVIRONMENTAL ASSESSMENT

ABSTRACT

This document describes the formulation, implementation, and effects of a local-federal cost-shared project to solve problems related to flooding within the Shavano Valley Watershed and downstream. These problems include private and public damages, hazard to life, risk to health and pollution. Various structural and nonstructural systems were investigated formulating alternative plans including a no-action plan. The total project cost is \$2,914,000, including \$2,892,000 PL-566 funds and \$22,000 local funds. The annualized net benefit is \$143,300 with a benefit/cost ratio of 1.53:1.00. No adverse environmental effects are expected. This document fulfills requirements of the National Environmental Policy Act, the Water Resources Council Principles and Guidelines for Water and Related Land Resources Planning, and the Soil Conservation Service National Watersheds Manual. It also serves as a basis for authorization of Public Law 83-566 funding.

Prepared under the authority of the Watershed Protection and Flood Prevention Act, Public Law 83-566, as amended (16 USC, 1001-1008) and in accordance with Section 102(2)(c) of the National Environmental Policy Act of 1969, Public Law 91-190, as amended (42 USC 4321 et seq).

Prepared by:

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WATERSHED AGREEMENT

between the

Shavano Soil Conservation District
(Referred to herein as SSCD)

Board of Commissioners - Montrose County
(Referred to herein as CC)

Uncompahgre Water User's Association
(Referred to herein as UWUA)

Colorado State Soil Conservation Board
(Referred to herein as CSSCB)

(SSCD, CC, UWUA, and CSSCB referred to herein
jointly as the sponsors)

and the

Soil Conservation Service
United States Department of Agriculture
(Referred to herein as SCS)

Whereas, application has heretofore been made to the Secretary of Agriculture by sponsors for assistance in preparing a plan for works of improvement for the Shavano Valley Watershed, State of Colorado under the authority of the Watershed Protection and Flood Prevention Act (16 U.S.C. 1001-1008); and

Whereas, the responsibility for administration of the Watershed Protection And Flood Prevention Act, as amended, has been assigned by the Secretary of Agriculture to SCS: and

Whereas, there has been developed through the cooperative efforts of the sponsors and SCS a plan for works of improvement for the Shavano Valley Watershed, State of Colorado, hereinafter referred to as the Watershed Plan - Environmental Assessment, which plan is annexed to and made a part of this agreement;

Now, therefore, in view of the foregoing considerations, the Secretary of Agriculture, through SCS, and the sponsors hereby agree on this plan and that the works of improvement for this project will be installed, operated, and maintained in accordance with the terms, conditions, and stipulations provided for in this watershed plan and including the following:

1. The sponsors will acquire, with other than P.L. 566 funds, such land rights as will be needed in connection with the works of improvement. (Estimated cost \$ 11,000.)
2. The sponsors hereby agree that they will comply with all of the policies and procedures of the Uniform Relocation Assistance and Real Property Acquisition Policies Act (42 U.S.C. 4601 et. seq. as implemented by 7 C.F.R. Part 21) when acquiring real property interests for this federally assisted project. If the sponsor is legally unable to comply with the real property acquisition requirements of the Act, it agrees that, before any federal financial assistance is furnished, it will provide a statement to that effect, supported by an opinion of the chief legal officer of the state containing a full discussion of the facts and law involved. This statement may be accepted as constituting compliance. In any event, the sponsor agrees that it will reimburse owners for necessary expenses as specified in 7 C.F.R.21, 1006 (c) and 21.1007.

The cost of relocation payments in connection with the displacements under the Uniform Act will be shared by the sponsors and SCS as follows:

	<u>Sponsors</u> (percent)	<u>SCS</u> (percent)	<u>Relocation Payment Costs</u> (dollars)
Relocation Payments	<u>0.8</u>	<u>99.2</u>	<u>0 1/</u>

- 1/ Investigation of the watershed project area indicates that no displacements will be involved under present conditions. However, in the event that displacement becomes necessary at a later date, the cost of relocation assistance and payments will be cost shared in accordance with the percentages shown.
3. The sponsors will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to state law as may be needed in the installation and operation of the works of improvement.
4. The sponsors will obtain all necessary federal, state, and local permits required by law, ordinance, or regulation for installation of the works of improvement.
5. The percentages of construction costs to be paid by the sponsors and by SCS are as follows:

<u>Works of Improvement</u>	<u>Sponsors</u> (percent)	<u>SCS</u> (percent)	<u>Estimated Construction Costs</u> (dollars)
Floodwater Retarding Structures	0	100	2,216,000

6. The percentages of the engineering services costs to be borne by the sponsors and SCS are as follows:

<u>Works of Improvement</u>	<u>Sponsors</u> (percent)	<u>SCS</u> (percent)	<u>Estimated Engineering Service Costs</u> (dollars)
Floodwater Retarding Structures	0	100	310,000

7. The sponsors and SCS will each bear the costs of project administration that each incurs, estimated to be \$11,000 and \$366,000, respectively.
8. The sponsors will obtain agreements from owners of not less than 50 percent of the land above each multiple-purpose and floodwater retarding structure. These agreements state that the owners will carry out conservation farm or ranch plans on their land and ensure that 50 percent of the land is adequately protected before construction of any dam.
9. The sponsors will provide assistance to landowners and operators to ensure the installation of the land treatment measures shown in the watershed plan.
10. The sponsors will encourage land owners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.
11. The sponsors will be responsible for the operation, maintenance, and replacement of the works of improvement by actually performing the work or arranging for such work, in accordance with agreements to be entered into before issuing invitations to bid for construction work.
12. The costs shown in this plan are preliminary estimates. Final costs to be borne by the parties hereto, will be the actual costs incurred in the installation of works of improvement.
13. This agreement is not a fund-obligating document. Financial and other assistance to be furnished by SCS in carrying out the plan is contingent upon the fulfillment of applicable laws and regulations and the availability of appropriations for this purpose.
14. A separate agreement will be entered into between SCS and sponsors before either party initiates work involving funds of the other party.

Such agreements will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

15. This plan may be amended or revised only by mutual agreement of the parties hereto, except that SCS may deauthorize or terminate funding at any time it determines that the sponsor has failed to comply with the conditions of this agreement. In this case, SCS shall promptly notify the sponsor in writing of the determination and the reasons for the deauthorization of project funding, together with the effective date. Payments made to the sponsor or recoveries by SCS shall be in accord with the legal rights and liabilities of the parties when project funding has been deauthorized. An amendment to incorporate changes affecting a specific measure may be made by mutual agreement between SCS and the sponsor(s) having specific responsibilities for the measure involved.
16. No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this plan, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.
17. The program conducted will be in compliance with all requirements respecting nondiscrimination, as contained in the Civil Rights Act of 1964, as amended, and the regulations of the Secretary of Agriculture (7 CFR 15), which provide that no person in the United States shall, on the grounds of race, color, national origin, sex, age, handicap, or religion, be excluded from participation in, be denied the benefits of, or otherwise be subjected to discrimination under any program or activity conducted or assisted by the Department of Agriculture.

SHAVANO SOIL CONSERVATION DISTRICT
60489 Carnation Road
Olathe, Colorado 81425

By Justin R. Jones
Title Chairman

Date August 22, 1986

The signing of this plan was authorized by a resolution of the governing body of the Shavano Soil Conservation District adopted at a meeting held on August 13, 1986.

Albert Soderquist
Secretary

Date 8-29, 1986

Shavano Soil Conservation District
60489 Carnation Road
Olathe, Colorado 81425

BOARD OF COMMISSIONERS
Montrose County Courthouse
Montrose, Colorado 81401

By Kenneth R. Neesham
Title Chairman of Board

Date August 22, 1986

The signing of this plan was authorized by a resolution of the governing body of Montrose County adopted at a meeting held on August 11, 1986.

Patricia Vernon

Board of Commissioners
Montrose County Courthouse
Montrose, Colorado 81401

Date 8-22-86

UNCOMPAHGRE WATER USER'S ASSOCIATION
P. O. Box 69
Montrose, Colorado 81402

By George C. Kuhn
Title Secretary of Association

Date August 22, 1986

The signing of this plan was authorized by a resolution of the governing body of the Uncompahgre Water User's Association adopted at a meeting held on August 18, 1986.

Keith Catlin
Director

Uncompahgre Water User's Association
P. O. Box 69
Montrose, Colorado 81402

Date 9/2/86

COLORADO STATE SOIL CONSERVATION BOARD
State Centennial Building, Room 615
1313 Sherman Street
Denver, Colorado 80203

By Lee Blue

Title Director

Date August 22, 1986

The signing of this plan was authorized by a resolution of the governing body of the Colorado State Soil Conservation Board adopted at a meeting on

7/17/86
Stewart W. Horn
Executive Director

Colorado State Soil Conservation
Board
State Centennial Bldg., Room 615
1313 Sherman Street
Denver, Colorado 80203

Date 9/8/86

SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE

Approved by:

Sheldon G. Boone
SHELDON G. BOONE
State Conservationist

8/22/86
Date

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SUMMARY

Project Name: Shavano Valley Watershed, Montrose County, Colorado

Sponsors: Shavano Soil Conservation District (SSCD)
Board of Commissioners, Montrose County (CC)
Uncompahgre Water Users Association (UWUA)
Colorado State Soil Conservation Board (CSSCB)

Description of Recommended Plan: It is recommended that two floodwater retarding structures be constructed to control flooding from the drainage area as shown on the project map (green area). The structures will be designed for sufficient capacity to store 100 years of sediment and the 50-year frequency flood event with releases at a non-damaging rate of flow. The earthen emergency spillways will operate no more often than once in 100 years. The structures are classified as high hazard dams (Class C) due to the risk to life downstream.

Resource Information

Size of Watershed: 35,200 acres

Land Use: Irrigated cropland 1,760 acres
Pasture and rangeland 32,720 acres
Other land (roads, farmsteads 720 acres
irrigation canals, and etc.)

Land Ownership: Private 37 percent
Public (BLM) 63 percent

Number of Farms: 45; average size 780 acres

Important Farmland: 1,760 acres

Wetlands: 62 acres (Types 1, 2, 3, & 6)

Floodplains: 334 acres irrigated cropland
250 acres pasture and rangeland
33 acres other land (farmsteads, road, and etc.)

Endangered
Species:

No adverse impact to listed species

Cultural
Resources:

No significant sites were found by detailed survey.

Problem
Identification:

The major problem identified in the watershed is flooding and the associated erosion caused by summer rainstorms. Damages include: direct flood and sediment damage to 334 acres of irrigated cropland, 250 acres of pasture and rangeland, 11 county and private road bridges, one state highway bridge, several irrigation facilities, 21 farmsteads, fences, utility lines, and interruption of irrigation services to 21,550 acres. Approximately 36 farms receive direct flood damages. Public safety is also a major concern in the watershed.

Candidate Plans
Considered:

1. No Project Action
2. Floodwater Retarding Structures

Project
Purposes:

The major project purposes are to significantly reduce the flood damages and sedimentation within the watershed and downstream, thereby increasing net income; improve public safety by reducing damages to private, county, and state roads and bridges, farmsteads; and improve the environmental quality of the watershed.

Principal Project
Measures:

Two floodwater retarding structures

Project Costs:

<u>Items</u>	<u>PL-566 Funds</u>		<u>Other Funds</u>		<u>Total</u>
	<u>\$</u>	<u>%</u>	<u>\$</u>	<u>%</u>	<u>\$</u>
Two floodwater retarding structures: .					
Construction	\$2,216,000	100	0	0	\$2,216,000
Engineering Assistance	310,000	100	0	0	310,000
Project Administration	366,000	97	11,000	3	377,000
Land Rights	0	0	11,000	100	<u>11,000</u>
Total					\$2,914,000

<u>Project Benefits (Annualized)</u>	<u>\$</u>	<u>Percent</u>
Agricultural	351,300	85
Non-Agricultural	61,500	15
Total	412,800	100

Land Area Benefitted - 22,166 acres

Impacts: (negative)

Land Use Changes : 1.7 acres of irrigated cropland and 57 acres of
of rangeland converted to structure site.

Natural Resources Changed or Lost: Energy, labor, and materials used
in the construction of the project
will be irretrievable.

INTRODUCTION

GENERAL

The Watershed Plan and Environmental Assessment (Plan-EA) for this project have been combined into a single document. The document describes plan formulation, discloses the expected environmental and economic impacts, and provides the basis for authorizing federal assistance for implementation.

The Plan was prepared under the authority of the Watershed Protection and Flood Prevention Act, Public Law 83-566 as amended (16 USC 1001-1008). The EA is in accordance with Section 102(2)(c) of the National Environmental Policy Act of 1969, Public Law 91-190, as amended (42 USC 4321 et seq.). Responsibility for compliance with the National Environmental Policy Act rests with the U.S. Department of Agriculture, Soil Conservation Service (SCS).

The sponsoring local organizations (sponsors) which requested planning assistance are the Shavano Soil Conservation District, Uncompahgre Water Users Association, Montrose County Board of Commissioners, and the Colorado State Soil Conservation Board. The sponsors participated in developing this plan. The SCS provided technical assistance to the sponsors in the plan development. Other federal, state, and local agencies, groups, and individuals participated and provided inputs in the planning process.

READER'S GUIDE

The format of the Plan-EA is directed by various regulations and guidelines. This reader's guide describes the planning process and helps the reader find items of particular interest.

Planning begins with the sponsors' request for assistance in solving water and related land resource problems. Interagency and interdisciplinary planners and the sponsors with public participation then follow a process that involves six basic steps--identify problems and opportunities; inventory resources and forecast future conditions; formulate alternative plans; evaluate effects of the alternatives; compare the alternatives; and select a recommended plan.

The environmental evaluation and planning process continues through the publication of the Draft to the Final Plan-EA, cycling back through the six steps and adding refinements in each cycle. This document summarizes the process and presents the results. The recommended plan is the result.

The Contents gives a complete listing of the principal topics covered in the document. The Watershed Agreement, although included in the front of the document, is the culmination of the planning effort and serves as the formal agreement (not the fund obligating document) between the sponsors and the SCS.

The Summary describes the finished plan in brief. It should not be used as the sole source of information if a complete understanding of the project is needed.

The Project Setting actually begins the presentation by describing the area and its resources in general terms. Problem and Opportunity Identification covers the reasons for initiating the plan and examines problems and opportunities uncovered during the planning process.

Inventory and Forecasting evaluates specific resources in depth and estimates the effect of various project actions on those resources. Table D, Evaluation of Identified Concerns presents this information. The future conditions of those resources are forecast for a future without the project.

Formulation of Alternatives is the heart of the planning process. Possible solutions are formulated to solve the identified problems and are compared with one another and to future conditions without any project action in order to select recommended plan.

The next two sections, Recommended Plan and Effects of the Recommended Plan, describe in detail the plan proposed for implementation and its effects on the economy and the environment. The prime numbered tables are presented on blue paper to facilitate their ready reference. These two sections should be read carefully for a thorough understanding of what is proposed and what the effects will be of installing the proposed project.

Appendix A contains letters and oral comments on the Draft Plan-EA, Appendix B contains support maps and figures, and Appendix C contains the project map which can be folded out for reference while Plan-EA is being read.

Any questions the reader may have should be referred to the State Conservationist, SCS, whose address and phone number are listed on the flysheet.

PROJECT SETTING

LOCATION AND SIZE

The Shavano Valley Watershed Project lies southwest of Montrose, Colorado and runs north to the confluence of Dry Creek approximately 2 miles west of Olathe in Montrose County. Montrose lies approximately 60 miles south of Grand Junction, Colorado. The structural sites are located approximately 9 miles west of Montrose.

The project boundary encompasses the entire drainage of Coal Creek (35,200 acres). Coal Creek is tributary to Dry Creek, which in turn, is tributary to the Uncompahgre River. The watershed is elongated; 6 miles wide in the upper drainage area, 2 miles wide just below the structures; one mile wide in the lower one quarter of the drainage, and approximately 14 miles long running south to north. Elevation ranges from 8500 feet in the upper portion of the watershed to about 5500 feet at the Coal and Dry Creek confluence.

The watershed is made up of about 35,200 acres of land which is 37% privately owned and 63% BLM land. Land use in the watershed includes about 1,760 acres irrigated farmland; 32,720 acres of pasture and rangeland; and 720 acres of other uses including farmsteads, feedlots, gravel pits, canals and ditches, county and local roads. All of the BLM managed land is used as pasture and rangeland. Major crops in the flood plain include small grain, corn, alfalfa and beans.

In addition, the flood plain along Dry Creek, for about 2 miles below its confluence with Coal Creek, is significant to this project (Reach III). Flooding from Coal Creek is a major source of damage to this reach of Dry Creek; therefore, effects from project action were evaluated at least 2 miles below the downstream project boundary and included in tables and narrative in the rest of the plan unless otherwise noted.

Several irrigation canals either divert water from Coal Creek or Dry Creek or cross the flood plains enroute to downstream irrigated areas. These canals and the lands they serve are susceptible to damage and loss of service when Coal Creek floods. A list of major ditches and canals of concern in this watershed study area is as follows:

<u>Canal</u>	<u>Location</u>	<u>Irrigated/Cropland Acres Served</u>
West Canal	Coal Creek	684 ac. .
CQ Lateral	Coal Creek & Dry Creek	5,164 ac.
"C" Canal	Coal Creek & Dry Creek	5,167 ac.
Ironstone Canal	Dry Creek	14,125 ac.

Irrigation water is supplied by the Uncompahgre Project developed by the Bureau of Reclamation.

Climate

The climate is semi-arid, characterized by low precipitation, low humidity, abundant sunshine, a fairly large range in daily and seasonal temperatures, and moderate westerly winds. Elevation changes cause large variations in the local climate within short distances, with increases in precipitation and decreases in temperature.

Average annual precipitation ranges from 9.5 inches in Montrose to about 16 inches in the upper watershed area. Monthly precipitation is fairly uniform with only April, August, and October averaging more than the 1.0 inch (at Montrose). Afternoon showers commonly occur during July through mid-September occasionally reaching thunderstorm intensity. Most historical floods of record have occurred in July and August with the most recent being in July 1982.

Typically clear skies and high solar radiation, combined with the elevation of the area, result in warm days and cool nights during the spring, summer, and fall. The days also are comfortably warm during the winter but the nights are cold. Maximum daytime temperatures vary from about 45-50°F in January to 85-95°F in July.

Geology and Soils

The Shavano Valley is a northwest-trending to north-trending valley which is a remnant of a valley formerly eroded through the Dakota sandstones and occupied by the Uncompahgre River. Small deposits of river gravel occur along the southwest side of the valley. Sandstone cliffs which formerly bordered the southwest side of the valley have retreated by slumping of the underlying shales leaving an area about four miles long and a little over one mile wide of landslide remnants consisting of sandstone slump blocks and boulders over shale. The predominate arable soils in the Valley are Mesa clay loam, Fruitland fine sandy loam, and Genola clay loam.

Social and Economic Characteristics

The Shavano Valley area was first explored, but not settled, by the Spanish. In 1873, the Ute Indians ceded the upper Gunnison basin to the federal government and settlement started almost immediately. The lure of mineral wealth was an impetus for initial settlement. Captain Gunnison explored much of the area in 1881 searching for a feasible railroad route across the Continental Divide. Since 1882, when a railroad and the first irrigation ditches were built in the valley, irrigation progressed to where there are now 171,000 irrigated acres in the lower Gunnison and Uncompahgre area of which the Shavano Valley and the interrupted service area is a part.

Since development of the Uncompahgre project by Bureau of Reclamation, agriculture has been the basic industry to the project area and county. The favorable qualities of the area such as climate, soils, and available

irrigation water has enabled farmers to grow a wide variety of crops. The surrounding rangelands public grazing lands and production of livestock feed on irrigated cropland has made livestock an integral part of the agricultural industry.

The cities of Montrose (pop. 8,722) and Olathe (pop. 1,262) are the principal trade areas near the watershed area. They also provide the social, religious, and health facilities.

There is an estimated slight population growth in the next 10 years in Montrose County. However, at this time there is no significant anticipated development in the benefitted area.

PROBLEM and OPPORTUNITY IDENTIFICATION

Resource problems and opportunities in the watershed were identified through field inventories, evaluation studies, and during meetings and other interactions that occurred during agency and public participation (see section entitled "CONSULTATION AND PUBLIC PARTICIPATION".)

Flooding

The major problem identified in the Shavano Valley Watershed is reduced farm income caused by flooding along with the associated erosion from summer rainstorms. There have been 24 flood events in the past 44 years. The most recent and most damaging flood occurred July 27, 1982 (estimated to be approximately a 50-year storm) causing over \$1,300,000 in damages. ^{1/}

Potential flood damages include: direct flooding of 334 acres of irrigated cropland and 250 acres of pasture and rangeland; damage to 11 private and county road bridges and one state highway bridge; interruption of irrigation services to 21,550 acres; damage to 15 landowners irrigation systems, 1 flume, 2 syphons, and 2 diversions; and damage to 21 farmsteads as well as fences, telephone lines, and rural waterlines. Approximately 36 farms could have direct flood damages. See Table A for estimated annual flood damages by evaluation reach.

Two adjacent sub-watersheds, each including about 2.5 square miles of drainage (controlled drainage area on Project Map), produce the peak flows for most flood events. Historically, local records and accounts claim that a summer storms move down those watersheds from west to east on a regular basis. A field reconnaissance shows these sub-watersheds to have a much higher percentage of exposed Dakota sandstone than the rest of the watershed. This suggests a high percentage of runoff occurs from a given rainfall event.

Flooding and streambank erosion from Coal Creek is also a major source of damage to the Dry Creek flood plain for about two miles below the confluence with Coal Creek.

^{1/}An additional \$7.5 million in damages due to agricultural interruption would have occurred if the ditch companies had been unable, in time, to have debris removal crews on the structures in Reach II and III.

TABLE A - FLOOD DAMAGES BY EVALUATION REACH
DAMAGES - AVERAGE ANNUAL DOLLARS

EVALUATION REACH 1/	FLOODPLAIN ACRES	CROP AND PASTURE (\$)	OTHER AGRICULTURE(\$)	ROAD, BRIDGE, AND UTILITIES(\$)	TOTAL (\$)
I	960 ^{2/}	14,780	27,781	0	42,561
II	5,820 ^{3/}	189,515	16,169	64,836	270,520
III	15,386 ^{4/}	227,572	4,256	5,046	236,874
TOTALS	22,166	431,867	48,206	69,882	549,955

Four canals (West Canal, OQ Lateral, "C" Canal, and Ironstone Canal) are susceptible to damage and/or loss of service when Coal Creek floods. The summer storms occur during the most critical part of the irrigation season.

Land use in the flood plain consists of 617 acres of irrigated cropland and pastureland. Current irrigated cropland includes: 18.3% corn; 19.8% small grain; 3.2% drybeans; 10.1% alfalfa; 43.2% pastureland; and 5.4% farmsteads and other idle land. Crop and pasture damage is estimated to be \$13,040 annually. Crop damages begin with a frequency of between a 1 and 2 year flood. Data regarding estimates for crop and pasture damages are as follows:

TABLE B - CROP AND PASTURE DAMAGE (Flood Plain)

Evaluation Reach 5/	Flood Plain (AC)	Damage				
		Production		Total	Per Acre	Percent of Flood Free
		Flood Free	Flooded			
I	222	\$ 49,350	\$25,710	\$23,640	\$ 106	48
II	246	\$ 33,320	\$18,180	\$15,140	\$ 62	45
III	149	\$ 29,860	\$18,670	\$11,190	\$ 75	37

Land use in the agricultural water interruption area consists of 21,550 acres including 7.3% farmsteads and other idle land. Current cropland includes: 31.1% corn; 21.5% drybeans; 11.2% alfalfa; 14.8% small grains; 7.0% fruits and vegetables; and 7.1% pasture. Crop and pasture damage is estimated to be \$418,830 annually. Crop damages begin with 15 year flood. Data regarding estimates for crop and pasture damages for a 100-year storm are as follows:

^{1/}See Project Map, Appendix C.

^{2/}Includes 738 acrs of interruption.

^{3/}Includes 5,574 acres of interruption.

^{4/}Includes 15,237 acres on interruption.

^{5/}Evaluation Reaches I and II are shown on the project map, Appedndix C.

TABLE C - CROP AND PASTURE DAMAGE (Interruption)

Evaluation Reach 1/	Inter- rupted (AC)	Production		Damage		
		Flood Free	Interrupted	Total	Per Acre	Percent of Flood Free
I	738	\$ 439,500	\$ 310,120	\$ 129,380	\$ 175	29
II	5574	\$3,319,540	\$1,190,650	\$2,128,890	\$ 382	64
III	15237	\$9,074,240	\$3,341,720	\$5,732,520	\$ 376	63

Other agricultural property located in the flood plain includes 21 farmsteads, an estimated 3.5 miles of fences, and 15 landowners' irrigation systems, along with 1 flume, 2 syphons, and 2 diversions. Total average annual damage to other agricultural property is \$41,600.

Nonagricultural property subject to damage consists of 12 road crossings on private, county, and state roads, and telephone and water lines. Damages to roads include the replacement of surface materials, bridges, and culverts, and the cost of sediment and debris cleanout. Costs associated with traffic delays and rerouting traffic, such as school buses, mail delivery, and the delivery of farm products during flood periods when major road repairs are required are extensive. Damages are estimated to be \$69,900 annually.

In addition to the flood damage and erosion discussed above, there is a definite hazard to life from the wash-out of roads and bridges. The hydrology analysis suggests most bridges are in danger of being washed out at a frequency of once every 10 years.

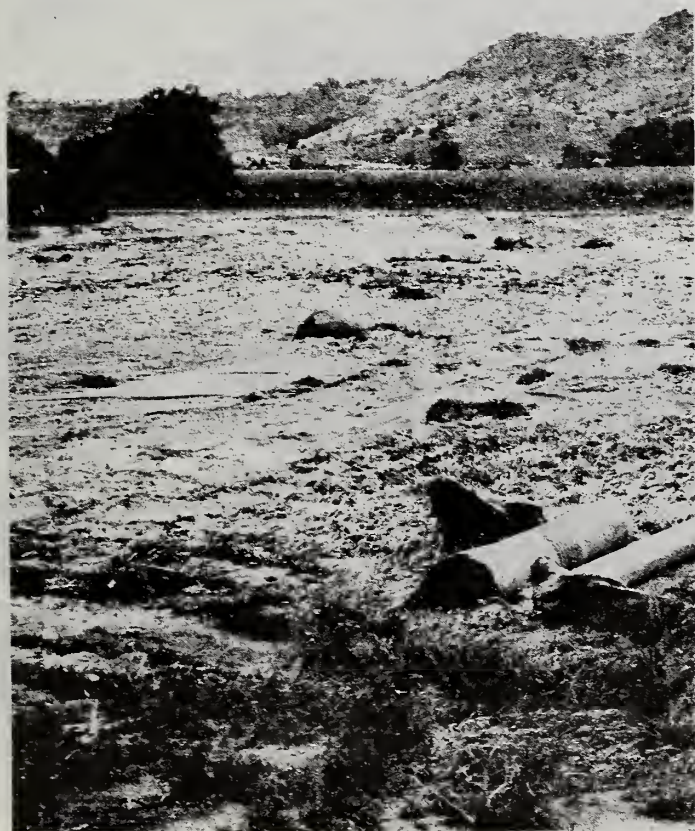
Each flood event produces a risk to health of the residents by damaging the rural water and septic systems, interrupting electric and natural gas utilities, both public and within the individual farmsteads requiring temporary lodging for those affected, and increases the risk and uncertainties in the farm operations by causing economic losses and hardships.

Sedimentation

Approximately 250 acres of cropland will have reduced yields and require sediment clean-up. Debris deposition damages farmsteads, increases harvest cost, farm machinery is damaged, reduces machinery life, and increases labor costs and rehabilitation costs (clean-up, leveling cropland, re-shaping and restoring the affected land areas). The quality of receiving waters, Dry Creek, Uncompahgre River, Colorado River and finally Lake Powell, is reduced because of debris, sediment, salinity and nutrients from the irrigated cropland erosion. Riparian and aquatic habitat are also damaged from each flood event. Sediment damages are estimated to be \$6,600 annually.

The opportunities exist to: reduce the flood and sediment damage to irrigated cropland, thereby enhancing farm income; improve water quality and riparian habitat downstream through reduced flooding and sedimentation; and reduce the hazards to human life through reduced road and bridge damage.

1/Evaluation Reaches I and II are shown on the project map, Appendix C.



Flood damages to rural utilities (upper left).

Irrigated cropland is damaged by flooding and sedimentation.



Flood damage to roads, bridges, culverts, and farmsteads.





**Flood damage to on-farm irrigation systems (upper left).
Each flood event causes severe land erosion.**



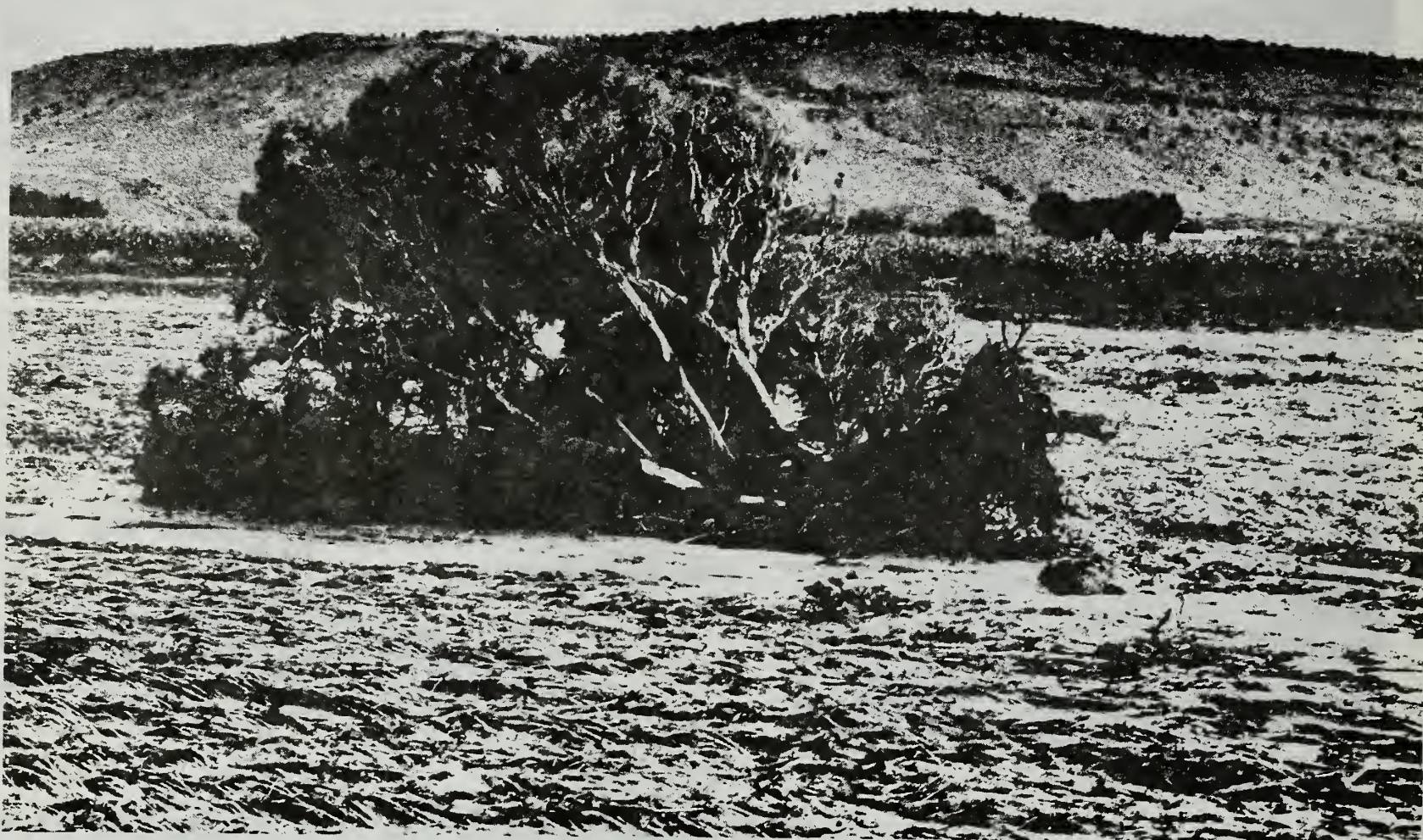
Erosion and sedimentation occurring in the flood plain is damaging irrigated crops.



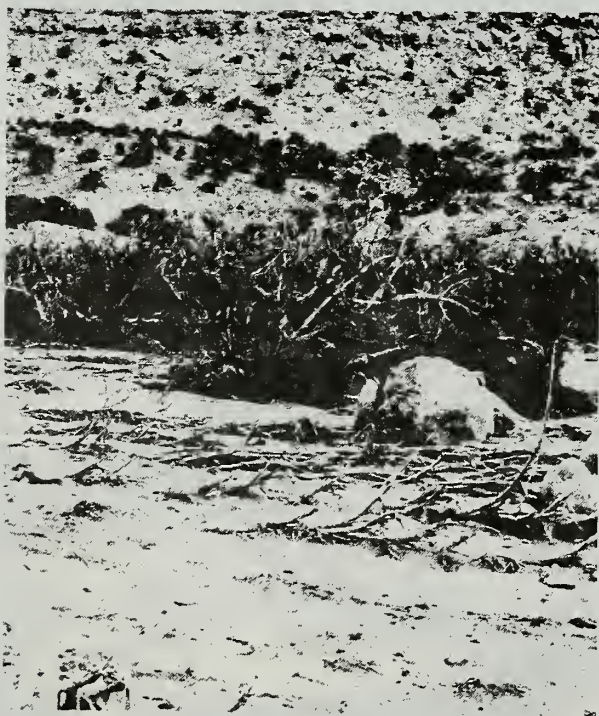


Flooding is destroying irrigated cropland and on-farm irrigation systems.





Debris and sedimentation damages cropland and irrigation systems.



INVENTORY and FORECASTING

Scoping of Concerns

A scoping process was used by the Interagency Interdisciplinary Team (ID Team) to identify the concerns significant in the decision-making process that might affect the selection of alternatives or be affected by project actions. Concerns may be significant because of public interest, technical or scientific interest, and/or legal status. Thus, the public agencies of government and the scientific community were involved in meetings to carry out the scoping process. The purpose of scoping is to concentrate studies on important concerns and eliminate as soon as possible any unimportant concerns. Table D displays the results of this scoping process as related to the project action. Elements of project actions, either singly or combined with others, are used as the building blocks to formulate alternatives.

Concerns that were scoped out as not significantly affecting or being affected by any type of project action included: air quality, wildlife migration routes, and recreation.

TABLE D - ANALYSIS OF ECONOMIC, ENVIRONMENTAL, SOCIAL, AND
CULTURAL FACTORS SIGNIFICANT TO DECISION MAKING

SHAVANO VALLEY WATERSHED, COLORADO

Factors	Degree of Impact	Significant to Decision Making	Remarks
Flood Hazard & Damage	High	Yes	
Hazard to Life & Risk to Health	High	Yes	Road & bridge wash-out & damage to public utilities
Sedimentation	High	Yes	
Prime, Unique, or Important Ag. Land	Medium	No	
Streams (Intermittent)	Medium	No	
Wetland/Riparian Habitat	Low	No	
Upland Habitat	Low	No	
Erosion	Medium	No	
Land Use	Low	No	
Farmland Crop & Pasture Production	Low	No	
Irrigation (included with flood damage)	High	Yes	Interrupted water supply & maintenance cost
Endangered & Threatened Plants & Animals	Low	No	
Cultural Resources	Medium	No	Value retrieval prior to construction, if present
Economic	High	Yes	
Transportation	High	Yes	Road & bridge wash-outs
Water Quality to Receiving Waters	Medium	Yes	Sediment & salinity
Appearance of the Landscape	Low	No	
Social Resources	Low	No	

Existing Resources

Irrigated cropland and rangeland are the dominant uses of the land within the watershed. The irrigated cropland is classified as prime and important under U.S.D.A. criteria.

The following table displays the crops/yields grown in the flood plain and in the area receiving agricultural water interruption:

TABLE E - INTERRUPTED AND FLOOD PLAIN COMPOSITE ACRES

Crop	Flood Plain Acreage (617 ac.)	Interrupted Cropland Acreage (21,550 ac.)	Yield
	%	%	
Small grain	19.8	14.8	91.1 Bu.
Feed corn	18.3	19.5	131.8 Bu.
Ensilage	-	11.6	21.0 T.
Alfalfa	10.0	11.2	4.5 T.
Irrigated pasture	2.8	7.1	8.4 Aum.
Pinto beans	3.2	21.5	19.4 Cwt.
Onions	-	5.9	375.6 Cwt.
Apples	-	0.4	5.7 T.
Lettuce	-	0.4	256.6 Cwt.
Potatoes	-	0.3	203.6 Cwt.
Native Pasture	36.0	-	1.0 Aum.
Rangeland	4.5	-	0.2 Aum.
Unused	5.4	7.3	-
TOTAL	<u>100%</u>	<u>100%</u>	

Wildlife Resources

Wildlife within the project area includes those that utilize brushland range, pastures, haylands and cropland. Included would be various raptors, songbirds, waterfowl, and small and large mammals. The primary habitat type is pinyon-juniper rangeland, with some irrigated cropland and hayland. An added attractant to wildlife is the aquatic and riparian habitat found along Coal Creek and the West Canal: These contribute to the habitat diversity of the area.

Heavy use is made of the project area by mule deer which utilize the browse in the foothills. Large numbers of deer also avail themselves of the agricultural residues that remain in the fields following harvest. Extensive game damage to crops has been experienced in the area which has been the site of special game reduction hunts conducted by the Colorado Division of Wildlife.

No threatened or endangered species are known to inhabit the project area. However, part of the environmental evaluation consisted of obtaining a list of threatened or endangered species from the U.S. Fish and Wildlife Service that may occur in the area. The biological assessment identified four threatened and endangered species that are found in the Upper Colorado River Basin area but not found in the project area.

Wetlands

The wetlands inventory identified 62 acres of Types 1, 2, 3, and 6 located along the Coal Creek streambank. These wetlands, along with Coal Creek and the irrigation canals, provide diversity to the arid landscape.

Forecasting Conditions

Conditions in the watershed and affected area have not significantly changed over the last decade. Cropping patterns and irrigated acres also have not changed significantly, nor are they expected to change in the future. There has been no urban development in the flood plain and none is anticipated in the future. The roads in the flood plain have had a moderate increase in use in the last decade; however, no change in road construction or flood proofing is anticipated.

Neither an ongoing nor an accelerated land treatment program would change the flood damages, erosion, or sediment damage problem in the watershed. The overall conditions are not expected to change in the future.

There are no significant changes expected in the wildlife, wetlands, or cultural resources. There are no significant cropping rotation or yield changes anticipated in the watershed from any of the proposed alternatives.

FORMULATION of ALTERNATIVES

During the preliminary planning process, possible solutions were formulated to make a net contribution to national economic development (NED). These solutions consisted of structural and non-structural measures formulated to alleviate the specific problems that were identified.

The scoping process described earlier was used in the conceptual phase of formulating possible solutions to assure consideration of all measures, strategies, and programs that might solve the problems. These solutions were not limited to those directly implementable under Public Law 566. Consideration was also given to the cooperative role of local, county, state, federal, and non-government interests for implementation.

Several possible solutions, including the without project condition, were evaluated during the planning process. These are the national economic development plan (NED); land treatment; sediment basin; floodway; and non-structural such as flood proofing, floodplain zoning and etc.

With more intensive planning the various possible solutions were reevaluated and compared, certain plans were then identified as candidate plans. Candidate plans are ones that could be selected as the recommended plan.

FORMULATION PROCESS

The major objective in formulating possible solutions was to alleviate flooding, erosion, and sedimentation in Shavano Valley. To begin the formulation process, brainstorming and similar interdisciplinary problem solving techniques were used to develop possible solutions to solve the problems resulting from flooding. Development of the possible solutions involved the public, various local, county, state, and federal agencies and special interest groups. These solution methods and concepts were evaluated for their effectiveness in reducing flood damages and their environmental effect. Cropping patterns were kept the same for with and without alternative conditions.

As the next step in the formulation process, combinations of solution methods and concepts were brought together incrementally to formulate rational alternative plans for reducing the flood problems. The measures which added net economic benefits were combined to form alternatives.

NED Formulation

By definition, the NED alternative is the one that maximizes net remaining benefits attributable to the project measures. With several structural elements having incremental benefits exceeding incremental costs, the NED Plan is the alternative with the greatest net benefits while reducing or eliminating flood damages downstream. The analysis

consisted of comparing the incremental benefits to the incremental costs for various combinations of four different structure sites and the resulting flood control achieved. Also evaluated, to some extent, was the size of the structure in relation to the levels of remaining damages allowed.

EVALUATION OF ALTERNATIVES PLANS

As a result of the plan formulation process described above, seven possible solutions, including the future without project or no project action alternative, were evaluated and developed to the extent necessary to determine costs, benefits, and effects on environmental resources. These tentative plans were discussed with the sponsors and other agencies at workshops and public meetings. The advantages, disadvantages, risk and uncertainty of each plan were considered.

General viability of each possible solution was determined by considering four aspects:

- Completeness - The extent to which an alternative plan accounts for all investments and actions necessary to realize planned results.
- Effectiveness - The extent to which an alternative plan alleviates the problems and achieves the opportunities identified.
- Efficiency - The extent to which an alternative plan is most cost effective.
- Acceptability - The extent to which an alternative plan is accepted by the public and compatible with existing laws, regulations, and policies.

The following possible solutions were investigated and found to be not viable:

(LAND TREATMENT)

Land treatment was considered as the first increment in solving the flooding and erosion-sedimentation problems. The effectiveness of any land treatment program would be limited by the arid climate, stoniness, shallow depth to bedrock, and steep slopes in much of the upper watershed.

Due to these factors there is little potential to improve rangeland conditions. Improving range conditions would have very little effect on the hydrologic response of the watershed to the storms that occur annually, however, there would be a reduction in erosion over the upland watershed and a reduction in sediment delivery. The more infrequent major storms that are used to determine structural capacities, would not be significantly reduced by improving range conditions. Also little sediment reduction would occur.

(NONSTRUCTURAL)

Components: This possible solution consists of floodproofing, dikes, relocation, floodplain acquisition, floodplain zoning, flood warning systems and flood insurance.

Costs: Total cost of floodproofing canals, diversions and bridges would be \$4,900,000 with an average annual cost, including operation, maintenance and replacement, of \$545,200.

Effects: Dikes, relocation, floodplain acquisition, floodplain zoning, flood warning systems and flood insurance were considered in planning and determined to be not feasible and did not meet the sponsors objectives. Floodproofing would reduce the damages from irrigation interruption, irrigation structures and roads and bridges - Average annual benefits accrued is \$385,100. Also, floodproofing would not meet the sponsor's objectives.

(GRASSED FLOODWAY)

Components: An agricultural grassed floodway was examined for flood conveyance through the cropland to Coal Creek. It was designed to carry 2,000 cfs. (12-year frequency flood) from the West Canal below to Coal Creek. The floodway would be approximately 4,700 feet long and 1,200 feet wide. This width is necessary to maintain non-erodible floodway velocities on the existing slope.

Cost: Total cost would be \$372,500 with an average annual cost, including operation, maintenance, and replacement, of \$35,100.

Effects: Average annual benefits is \$2,600. This plan achieves very little of the flood control objectives. The necessary width involves almost the entire present flood plain along this off-channel reach. There would be no reduction of flooding along Coal Creek or Dry Creek. Therefore, continued flooding could be expected along these reaches. There is no provision to protect West Canal; therefore, interruption of irrigation services could be expected to continue in the future. This possible solution was analyzed to be not feasible.

ROCK-RIPRAP FLOODWAY

Components: This possible solution is a rip-rap channel that will carry 2,000 cfs. (12-Year frequency flood) to Coal Creek. It will be 4,700 feet long with a 26-foot bottom width and approximately 7 feet deep.

Costs: Total costs would be \$3,015,200 with an average annual cost, including operation, maintenance, and replacement, of \$283,000.

Effects: This plan would provide flood protection (12-year frequency) to about 130 acres of off-channel floodplain between the West Canal below the drainage area (green area on the project map) and Coal Creek. The floodplain and improvements along Coal Creek and Dry Creek in reaches II and III would not be significantly impacted from present condition flooding problems. West Canal siphon would be protected.

Interruption of irrigation services could be expected to continue in the future on the other canals. Average annual benefits derived is \$38,300. This plan is considered not feasible and would not meet the sponsors' objective.

SEDIMENT BASIN

Components: This possible solution includes two sediment basins that will collect sediment from the drainage area (green area on project map) with a life of 25 years. There would be sufficient floodwater retarding storage for the 5-year frequency storm. Floods of a greater frequency would cause the emergency spillway to function with little change in the magnitude of downstream flooding from present conditions.

Costs: Total cost would be \$482,500 with an average annual cost, including operation, maintenance, and replacement, of \$71,300.

Effects: This plan would remove the major sediment and debris load from flood waters originating in the drainage area. The off-channel flood plain between the sediment basins and Coal Creek, as well as flood plains and improvements along Coal Creek and Dry Creek, would experience only minor reduction of floodwater inundation. There would, however, be some benefits from reduced sediment and debris deposition on these areas. There are no additional provisions to protect the West Canal; therefore, interruption of irrigation services could be expected to continue in the future on a slightly less frequent basis than under present conditions. Average annual benefits of \$21,000 would be accrued. This plan is considered not feasible and would not meet the sponsors' objective.

The following alternatives were developed:

Alternative 1 - NO PROJECT ACTION (FUTURE WITHOUT PROJECT)

No Action Alternative: The conditions discussed in the sections "Problem and Opportunity Identification and "Inventory and Forecasting" (pages 11-18) entitled would apply if this alternative were selected.

Alternative 2 - NATIONAL ECONOMIC DEVELOPMENT-FLOOD WATER RETARDING STRUCTURES

Components: This alternative contains measures consisting of two single-purpose floodwater retarding structures (SV-1 and SV-2) and concrete lining approximately 2,000 feet of that portion of West Canal that lies on the downstream slope of the structures.

Costs: Total project cost would be \$2,914,000. The discounted average annual cost would be \$269,500, including operation, maintenance, and replacement.

Effects: Installation of this alternative will accrue \$412,800 of discounted average annual benefits through reduced flood damages and sedimentation, thereby increasing farm productivity and net income, improve public safety by reducing road and bridge washouts, and improve downstream water quality and riparian habitat by reducing streambank erosion and sedimentation. This plan is considered feasible and meets the sponsors' objectives.

COMPARISON OF CANDIDATE PLANS

The next step after formulating alternative plans was to identify those alternatives that could most realistically be considered as candidate plans. The Alternative 1 - No-Project Action or Future Without Project, and the Alternative 2 - National Economic Development-Floodwater Retarding Structures were considered as candidate plans and are compared in Table F.

The other possible solutions were not considered as alternatives or candidate plans because their cost exceeds their benefits. Also, the others did not meet the sponsors' project objective and did not solve the resource problems.

PROJECT INTERACTION

No significant interaction has been identified between the candidate plans and existing or potential projects.

RISK AND UNCERTAINTY

The degree of risk and uncertainty involved in each possible solution and in each project element was considered throughout the planning process. Risk of loss of life was paramount in determining the structural capacity requirements for the selected plan. The structures have been classified as "Class C" due to the risk to life downstream.

RATIONALE FOR PLAN SELECTING

At a public meeting, the local sponsors selected the NED alternative as the recommended plan. Prior to selection of the recommended plan, the only unresolved conflicts were the differences in the preferred location of the flood channel and storage capacity. An incremental analysis was made to determine the NED plan. The analysis was used to determine site selection and structural size.

The selected plan meets National Economic Development and the sponsors' objective for solving the resource problems. An incremental on analysis was made what degree of protection would be given. No unresolved adverse impacts are associated with the plan. No unresolved conflicts were surfaced between the selected plan and preferences expressed by agencies, groups, or individuals.

TABLE F - SUMMARY AND COMPARISON OF CANDIDATE PLANS
SHAVANO VALLEY WATERSHED, COLORADO^{1/}

Comparison Factors and Effects	No Project Action Candidate Plan 1 (Without Project)	NED/Recommended Candidate Plan 2 (Two Floodwater Retarding Structures)
<u>Project investment</u>	\$0	\$2,914,000
<u>NED Account</u>		
Adverse Annualized	--	\$ 269,500
Beneficial Annualized	--	\$ 412,800
Net Beneficial	--	\$ 143,300
<u>EQ Account</u>		
<u>Beneficial</u> Sedimentation	No Effect	Reduced on 250 acres of irrigated cropland, canals, on-farm irrigation systems, and to farm machinery
Upland Habitat	No effect	Quality reduced on 21.2 acres of area disturbed
Water Quality	No effect	Improvement downstream
Wetland/Riparian Habitat	No effect	Improvement along Coal Creek
Flooding	No effect	Reduced damage to 617 acres irrigated cropland, 12 roads and bridges, 15 on-farm irrigation systems, 21 farmsteads, rural water and telephone systems
Visual Quality	No effect	--
<u>Adverse</u> Sedimentation	Continued damage	--
Upland Habitat	Continue to degrade	--
Water Quality	Continued damage	--
Wetland/Riparian Habitat	Continue to degrade	--
Flooding	Continued damage	--
Visual Quality	Continue to degrade	Visual man-made structure on the landscape
<u>OSE Account</u>		
<u>Beneficial</u> Prime Farmland	No effect	Improvement
Risk to health	No effect	Reduced
<u>Adverse</u> Prime Farmland	Continue to degrade	--
Risk to Health	Continued risk	--
Land Use Change	--	Convert 57 acres of rangeland and 1.7 acres of irrigated cropland to structural measure

^{1/} Evaluated at 8-5/8% for a 100-year period. December 1985 price level used. FY 1985 current normalized price used for crop and pasture.

RECOMMENDED PLAN

PURPOSE AND SUMMARY

The selected alternative was candidate plan 2, the National Economic Development alternative. It recommends two floodwater retarding structures be constructed above the West Canal to control sediment and flooding. The structural measures will be installed in one year.

The primary purpose of this plan is to reduce flood damages in the watershed and downstream. It also reduces the risk to life and health associated with flooding.

PLAN ELEMENTS

Project structural measures consist of two single-purpose floodwater retarding structures (SV-1 and SV-2) and approximately 2,000 feet of concrete lining of West Canal on the downstream slope of the structures. They will be designed as "dry dams" with no permanent storage of water. The structures retard runoff from a combined area of 5.75 square miles. The structures have a designed life of 100 years. See the Project Map for structure locations and the area controlled. Figures 1 and 2 show pertinent data relating to each structure. Estimated costs are shown in Tables 1 and 2. Structural data are shown in Tables 3 and 3A.

There are no displaced persons nor relocation assistance involved in the structural program.

Two Floodwater Retarding Structures

Floodwater retarding structure SV-1 is on the north drainage of the two in the project area (see green area on project map). Floodwater retarding structure SV-2 is on the south drainage in the project area. The drainages for each of these sites is in rangeland.

The structural sites are located along the west side of the Shavano Valley at the lower ends of alluvial fans deposited at the mouths of two small canyons. Bedrock underlying the sites consists of greenish-gray to reddish-brown claystone and siltstone of the Brushy Basin Member of the Morrison Formation of Jurassic geologic age. The Brushy Basin shales are overlain by sandstones and shale of the Burro Canyon and Dakota Formations, which are present at higher elevations on both sides of the Shavano Valley.

Outcrops of claystone and siltstone occur at the north end of structure SV-1 and at the south end of structure SV-2. These outcrops do not appear to be disturbed by landslide movement and are expected to be stable foundation material. The portion of the dams' centerlines lying across the valley bottom is underlain by alluvial deposits. These deposits range from silt and fine sand to cobbles and large boulders and are estimated to have an average thickness of about 30 feet and a maximum thickness of about 50 feet. These alluvial deposits consist largely of

coarser materials which have a relatively low consolidation potential, and stripping of the lower density materials for the foundations is expected to be mainly limited to the upper 10 feet. It will probably be desirable to excavate the cutoff trenches only partially. It is expected that there will be no special problems in locating suitable foundations for the principal spillways.

The south end of the structure SV-1 and the north end of structure SV-2 share abutments in a hill formed by a block slump of Dakota and Burro Canyon Formations.

For the borrow material, it is estimated that most of the materials excavated in the emergency spillways and foundations can be used in compacted fill in the dam. The main source of material for the impermeable center sections of the dam embankments will be the deposits of alluvial silty and sandy clays lying in the small tributary valleys in and above the reservoir areas. It is estimated that about 260,000 cubic yards of this type of material are available for use in both structures embankments. The remainder of the material which will be used in the outer zone of the embankments will be obtained from other alluvial deposits consisting mainly of sandy materials with sandstone, gravel, and rocks from the emergency spillways, and from the foundation of the dams. The dams and emergency spillways will have a protective sand and gravel mulch cover obtained from existing materials on-site. The remaining land area disturbed will be revegetated with plant materials that will replace winter range habitat values important to mule deer and other species of wildlife.

Approximately 2,000 feet of West Canal will be relocated when floodwater retarding structures SV-1 and SV-2 are constructed. To replace this portion of the canal a concrete-lined canal will be constructed on the downstream slopes of both structures. The canal will also serve as an outlet for the principal spillway conduits discharge of both structures. Because the capacity of the canal, being approximately 50 cfs, the headgate to the canal will have to be controlled to provide capacity for reservoir release flow. Since the principal spillways can outlet flows greater than 50 cfs, on storms greater than the 50-year frequency, an overflow weir section will be located on the lower bank of the concrete canal lining. This will allow flows greater than 50 cfs to spill. This weir section will keep the canal from breaking when flows exceed 50 cfs. Land right costs for the canal are included in the estimates for both structures.

Both structures have been classified as high hazard (Class C) dams by the State Conservation Engineer due to the property below. A Breach analysis was made of structure SV-2. According to the Soil Conservation Service National Engineering Manual, it is not realistic to assume simultaneous failure where two adjacent dams exist. Therefore, only structure SV-2 was evaluated, as it was the larger of the two proposed structures. The National Weather Service "DAMBRK" Model was used to model a breach condition. The resulting breach hydrograph was used as input in TR-20 (Project Formulation-Hydrology) for downstream floodwater routings.

The results of this analysis showed a peak discharge at the dam of 15,200 cfs would result from a dam breach over a 30-minute time period.

This discharge would reduce to 9,000 cfs at a distance of 1.84 miles below the dam where flows would enter the Coal Creek channel. The discharge would further reduce to a discharge near the 100-year frequency flow (without project condition) of 3,200 cfs at a distance of about 4 miles below the dam. An inundation map showing the breach flood boundary to the point where the breach flow is equal to the 100-year frequency flow is in Appendix B.

There are 4 to 5 homes within the breach flood boundaries along with 0.5 to 1 mile of county roads. If county bridges further down Coal Creek should become blocked by debris, several additional miles of county roads, and houses would be flooded.

Although a dam failure is not expected, there is always the remote possibility of failure; therefore the breach inundation map in Appendix B is available for inclusion in an emergency action plan that must be prepared by the sponsors before construction is initiated.

Recreational developments and municipal and industrial water supply are not an objective of the sponsors as these are not a primary problem in the area. In addition, there appears to be no opportunity to provide storage for these purposes due to low annual water yields from the watershed tributaries.

A detailed archaeologic and historic survey was completed for the project area. The survey considered the area to be clear of significant and/or National Register of Historic Places eligible cultural resources. If previously undetected cultural resources are discovered during construction, work on the affected portion of the project will cease and further cultural evaluation will be done to determine the importance of the finding.

There is no displacement of people, businesses, of farm operations that will require relocation assistance as a result of the installation of the planned works of improvement.

Floodwater Retarding Structure - SV-1

This structure has approximately 2.8 acres located on Bureau of Land Management land and 19.8 acres located on private land. Approximately 0.6 acres are on irrigated cropland and 22.0 acres are on rangeland. The dam covers approximately 6.2 acres, the reservoir at the emergency spillway crest elevation covers 15.0 acres, and the emergency spillway covers approximately 1.4 acres.

Foundation treatment will consist of removing and recompacting the foundation and cutoff core into the alluvium material beneath the embankment.

The principal spillway will consist of a standard covered two-stage inlet, a 30-inch diameter reinforced concrete conduit, and an impact basin that will outlet the flow into West Canal. The low stage crest will be at the 100-year sediment pool level. The high stage crest will be at the 50-year flood pool level. The emergency spillway crest will be at the 100-year flood pool level.

The low stage spillway releases will be limited to no greater than 25 cfs at the 50-year frequency principal spillway routing. At least 85 percent of the flood pool will evacuate in less than 10 days (100-year frequency principal spillway routing.)

The emergency spillway will be a shaped earthen spillway with a protective sand and gravel cover obtained from existing materials on-site. It will be constructed around the north end of the dam. The spillway depth will be 7.1 feet, the bottom width will be 100 feet and the level section is about 200 feet. The frequency of emergency spillway operation is once in 100 years. Excavation will be in a ridge which is mantled on the downstream side by a few feet of sandstone slabs and boulders that are remnants of an older talus slope below former sandstone cliffs. Most of the excavation will be in claystone of the Morrison Formation, much of which can probably be used in the dam embankment. The spillway return is underlain mainly by large sandstone fragments which are expected to be resistant to erosion.

Floodwater Retarding Structure - SV-2

This structure has approximately 1.4 acres located on Bureau of Land Management land and 34.6 acres located on private land. Approximately 1.1 acres are on cropland and 34.9 acres are on rangeland. The dam covers approximately 8.0 acres, the reservoir at the emergency spillway crest elevation covers approximately 22.4 acres, and the emergency spillway covers approximately 5.6 acres.

Foundation treatment will consist of removing and recompact the foundation and cutoff core into the alluvium material beneath the embankment.

The principal spillway will consist of a standard covered two-stage inlet, a 30-inch diameter reinforced concrete conduit, and an impact basin that will outlet the flow into West Canal. The low stage crest will be at the 100-year sediment pool level. The high stage crest will be at the 50-year flood pool level. The emergency spillway crest will be at the 100-year flood pool level.

The low stage spillway releases will be limited to no greater than 25 cfs at the 50-year frequency principal spillway routing. At least 85 percent of the flood pool will evacuate in less than 10 days (100-year frequency principal spillway routing.)

The emergency spillway will be a shaped earthen spillway with a protective sand and gravel cover obtained from existing materials on-site. It will be constructed around the south end of the dam. The spillway depth will be 5.9 feet, the bottom width will be 200 feet, and the length of level section is about 200 feet. The frequency of emergency spillway operation is once in 100 years. Excavation will be in a ridge underlain by older alluvial materials and shales of the Dakota Formation. Much of the excavation will be in shale, much of which can be used in the dam embankment. The spillway return is expected to be resistant to erosion.

MITIGATION FEATURES

No mitigation features are planned as part of this project. The right-of-way grant issued by the Department of Interior, Bureau of Land Management (BLM) will address any mitigation required by that agency.

PERMITS AND COMPLIANCE

An agreement to relocate and modify the West Canal will be completed by the sponsor and the U.S. Department of Interior, Bureau of Reclamation before construction begins.

A right-of-way grant will be obtained by the sponsors from the BLM.

COSTS

The estimated project installation cost for structural measure is \$2,914,000 as shown in Tables 1 and 2. This cost includes construction, engineering, land rights, and project administration. A further breakdown is described as follows:

Project construction costs are estimated to be \$2,216,000. This consists of the engineer's estimate of the contract cost for construction of structural measures, plus 2 percent for mobilization and 15 percent for contingencies. Construction costs include the two dams, emergency spillways, and borrow areas. Construction costs also include relocation and the concrete lining of West Canal below the dams. The estimated cost is based on construction quantities from preliminary plans and current unit costs for similar work and materials in the locality.

Engineering costs are estimated to be about \$310,000. They are to provide construction surveys, foundation studies, laboratory analysis of materials, structure design, and preparation of construction plans.

Land rights costs are estimated to be \$11,000. This includes the cost of acquiring the land needed for structural measures. Sponsors may acquire land rights by title or easements in perpetuity.

No relocation assistance is needed for this project.

Project administration for installation is estimated at \$377,000. Costs for administrative, supervisory, cartographic, construction layout, and inspection services provided by the SCS are estimated to be \$366,000. Project costs for administrative and supervisory services by the sponsors are estimated to be \$11,000.

The entire project structural measures installation cost is allocated to flood prevention. There is no non-project cost associated with the project.

Installation costs for the project will be shared by the local sponsoring organizations and the federal government under authority of the Watershed Protection and Flood Prevention Act (P.L. 566, 83rd Congress, 68 Stat. 666) as amended. P.L. 566 funds will bear all construction and engineering service costs. Other funds will bear the cost of land rights. The SCS and the sponsors will each furnish their portion of the project administration costs.

INSTALLATION AND FINANCING

The estimated project costs for the installation of the structural measures are being assumed by the landowners, the sponsoring local organizations, and the SCS. A number of state and federal agencies along with local organizations are also participating by agreement with the sponsors.

In order to coordinate the installation of the structural measures in a two-year period as scheduled in the Fiscal Year obligations, close cooperation and assignment of specific responsibilities is required.

The estimated schedule of expenditures over the two-year installation period is tabulated below by use and source (Table G). The proposed schedule of expenditures may be adjusted from year-to-year by mutual agreement between the SCS and the sponsors. Adjustments will be based on fund appropriations and installation progress of project measures shown on Table 1. Table 2 shows the distribution of structural measures cost between PL 566 and other funds.

TABLE G - SCHEDULE OF INSTALLATION AND OBLIGATIONS

Fiscal Year	Items	PL 566 Funds	Other Funds	Total Funds
1st	Financial Assistance Landrights	\$ --	\$ 11,000	\$ 11,000
	Technical Assistance & Engineering Service	350,000	9,000	359,000
2nd	Financial Assistance Structural	2,216,000	--	2,216,000
	Technical Assistance & Engineering Service	326,000	2,000	328,000
	TOTALS	\$ 2,892,000	\$ 22,000	\$2,914,000

Obtaining land rights, investigation, and design will occur in the first year while awarding the contract and construction will occur during the second year.

Although the project installation period is two years, the lands for structural measures should be acquired during the first year.

In the event sponsors cannot obtain land rights by donations or land exchanges, the sponsoring local organizations must have the needed land interests appraised by a qualified land appraiser before initiation of negotiations. The landowner or his representative must be given every reasonable opportunity to accompany the appraiser during his inspection of the property. The sponsors must then establish the amount they believe to be just compensation for the land rights, but in no case less than the appraised value. The sponsors will then make a prompt offer in writing to acquire the land rights and include a statement and summary of the basis for the amount established as just compensation. In the event landowners desire more compensation and negotiations fail, sponsors may then instigate condemnation procedures to acquire the needed land rights.

The SSCD, UWUA, CC, and CSSCB collectively have the right of eminent domain needed to provide land rights for the structural works of improvement.

The SSCD will be the local representative of the sponsoring local organizations responsible for dealing with the SCS in the administration, contracting, and completion of construction contracts.

Responsibilities of each organization in the installation of the project works of improvement are as follows:

The Shavano Soil Conservation District will:

1. Provide leadership and guidance for the soil and water program for land and water conservation and pollution control, including the on-going programs for planning, application, and maintenance of land treatment measures in the watershed.
2. Exercise the right of eminent domain if necessary to provide the needed land rights by the end of the first year.
3. Provide funds for project administration.
4. Sign project agreements for construction.

The Soil Conservation Service will:

1. Provide the necessary engineering services needed to prepare final designs, cost estimates, and construction specifications. Engineering designs will meet current national and state construction criteria.
2. Award the construction contracts needed to install all works of improvement.
3. Provide the necessary project administration to carry out the project construction. This includes providing construction inspection, preparing monthly pay estimates, and certifying the completion of contracts.

The SSCD will provide funds for their share of the cost from their general operating budget.

Federal assistance for installing structural measures will be provided under the authorization of the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress, 68 Stat. 666) as amended.

Federal assistance for the installation of structural measures will be made on the following basis:

1. Land rights will be obtained by the local organizations before structural design and specifications are made for each contract. The SSCD, the UWUA, the CC, and the CSSCB will exercise the power of eminent domain, if necessary, to assure that these requirements are met.
2. Project agreements will be entered into between the sponsors and the SCS outlining the responsibilities that each will assume in connection with and prior to the installation of the works of improvement.
3. Reasonable evidence of conformity to state and federal laws and regulations will be presented.
4. An operation and maintenance agreement will be executed and signed by the SSCD and the SCS to assure continuous functioning of the structural measures for the 100-year project period.

5. Sponsors will accept structures following completion of each contract.

Structural measures will be constructed under a competitive construction contract.

Construction will be carried out under guidelines of construction management and equipment control that will minimize erosion and pollution and maintain environmental quality during construction. These specific measures will be included in construction drawings and specifications. When special or unforeseen problems involving pollution or evidence of archeological sites arise during construction, appropriate measures will be taken to control them by contract modification.

Structural measures will be constructed following safety and health standards set forth in Part 1926, "Construction Standards and Interpretation", published by the Occupational Safety and Health Administration (OSHA) and to conform to all Colorado laws.

All federal and state pollution requirements will be met during and after construction.

If any cultural resources are encountered during construction, SCS will give appropriate notice to the Secretary of the Interior in accordance with Section 3 of Public Law 93-291. SCS will take action to protect or recover, or both, any significant cultural resources discovered during construction.

OPERATION AND MAINTENANCE

The project measures have been designed to operate effectively for 100 years with proper maintenance. During this period, it is expected that some damage may occur to the structures from large storms. Repair of these damages and all maintenance of the structures are considered to be operation and maintenance cost.

Copies of the Colorado Watershed and RC&D Operation and Maintenance Handbook will be provided to the sponsors. The Handbook will acquaint sponsors with the essentials of operation and maintenance of their projects. The information and suggestions will help each sponsor to understand and appreciate their job more fully so that it can be carried out in a timely and more efficient manner.

The structural measures will be operated and maintained by the SSCD at an estimated annual cost of \$18,100. This represents material, labor, and equipment as necessary to repair, maintain, and assure the continued operation of the structural measures as designed. Also, it includes the cost of dam liability insurance and lawyers' fees. This does not cover maintenance of existing improvements, canals, and floodways in the watershed that are not project measures. However, it is recognized that the existing improvements on West Canal and the project features will be operated and maintained as part of an integrated system for flood control during the life of the project.

An operation and maintenance agreement will be developed, including specific provisions for the retention and disposal of property acquired or improved with P.L. 566 financial assistance, and will be signed by the SSCD and the SCS prior to signing of the project agreement for

installation of works of improvement and the bid advertisement for the construction contract. Each operation and maintenance agreement will enumerate the particular considerations needed to cover requirements of each group of structures to be contracted. The principal considerations and requirements are discussed as follows:

1. No operation of the floodwater retarding structures is required as they have ungated outlets.
2. Operation of the project measures will require regulation of the canal flows when heavy rainstorms occur. UWUA diversion flows of irrigation water into the West Canal will be reduced to provide canal capacity for the floodwater retarding structure releases.
3. Floodwater retarding structure releases greater than the 50 cfs capacity of West Canal will overtop a control weir section in the lower bank of West Canal to flow over cropland to Coal Creek.
4. Maintenance will involve removing debris from the reservoirs, sediment from West Canal, maintaining protective vegetative cover where needed, spraying to control noxious weeds, and keeping all structures in serviceable condition and repair as needed during the lifetime of the structure.

To further assure maintenance and improvement of the existing environment and to provide vector control, the following will be done as regular items of maintenance when need develops; however, first consideration will be given to wildlife food and cover:

1. Proper drainage behind the floodwater retarding structures to minimize the ponding of water.
2. Periodic removal of vegetation and floatage from shallow inundated areas of the reservoirs.
3. Channeling (interceptor drains) in the event marshy or seepage areas develop below the dams.

The structural works of improvement will be inspected annually before the flood season and after each large storm runoff. For three years after completion of construction, the inspection will be made by representatives of the sponsoring organizations and the SCS. After the third year, the sponsors will continue to make the inspections.

Inspection reports will cover maintenance needed, outline what will be done, and establish a schedule for accomplishing the work promptly. Each inspection report and a record of action will be kept on file by the sponsoring organization with copies provided to the SCS. No federal funds are provided for operation and maintenance of structural measures.

TABLES

The following prime-numbered Tables 1, 2, 3, 3A, 4, 5, and 6 are presented on blue paper to facilitate their ready reference. They show the estimated costs and data of structural measures, their cost-sharing, their annualized values, the annualized benefits, flood damage reduction benefits, and the benefit to cost comparison.

TABLE 1 - ESTIMATED INSTALLATION COST
SHAVANO VALLEY WATERSHED
MONTROSE COUNTY, COLORADO

INSTALLATION Cost Item	UNIT	NUMBER		ESTIMATED COST (DOLLARS) 1/					TOTAL
				P.L. 566 Funds		Other		Total	
				Nonfederal Land	Total	Nonfederal Land	Other		
STRUCTURAL MEASURES									
Floodwater Retarding Structure	No	2	2	2,892,000	2,892,000	22,000		22,000	2,914,000
TOTAL PROJECT				2,892,000	2,892,000	22,000		22,000	2,914,000

1/ Price Base December 1985

2/ Federal agency responsible for assisting in installation of works of improvement.

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TABLE 2 - ESTIMATED COST DISTRIBUTION
STRUCTURAL AND NON-STRUCTURAL MEASURES

Shavano Valley Watershed, Montrose County, Colorado
(Dollars) 1/

	Installation Cost					P.L. 566 Funds					Installation Cost-Other Funds					Total Installation Cost
	Constr'n	Engineer- ing	Land Rights	Reloc. Pmts. Admin.	Total PL 566	Constr'n	Engineer- ing	Land Rights	Water Rights	Reloc. Pmts. Admin.	Total Other					
STRUCTURAL MEASURES																
Floodwater Retarding Structures																
SV 1	971,000	136,000	—	—	160,000	1,267,000	—	5,000	—	5,000	10,000	1,277,000				
SV 2	1,103,000	154,000			183,000	1,440,000	—	6,000	—	5,000	11,000	1,451,000				
West Canal Lined	142,000	20,000			23,000	185,000	—	2/—	—	1,000	1,000	186,000				
GRAND TOTAL	2,216,000	310,000	—	—	366,000	2,892,000		11,000		11,000	22,000	2,914,000				

1/ Price Base December 1985

2/ Land Rights cost included in with Dam Land Rights

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TABLE 3 STRUCTURAL DATA
Shavano Valley Watershed
Montrose County, Colorado

Item	Unit	Dam SV-1	Dam SV-2	Dam Total
Class Structure		C	C	xxx
Seismic Zone		I	I	xxx
Uncontrolled Drainage Area	Sq.Mi.	0	0	0
Controlled Drainage Area	Sq.Mi.	2.46	3.29	5.75
Total Drainage Area	Sq.Mi.	2.46	3.29	5.75
Runoff Curve No. [1-day] [II]		86	85	xxx
Time of Concentration	Hrs.	1.0	1.0	xxx
Elevation Top of Dam	Ft.	6078.8	6085.8	xxx
Elevation Crest Emergency Spillway	Ft.	6071.7	6079.9	xxx
Elevation Crest High Stage Inlet	Ft.	6070.7	6079.1	xxx
Elevation Crest Low Stage Inlet	Ft.	6063.4	6072.5	xxx
Emergency Spillway Type		Earth	Earth	xxx
Emergency Spillway Bottom Width	Ft.	100	200	xxx
Emergency Spillway Exit Slope	%	10	20	xxx
Maximum Height of Dam	Ft.	40.8	37.8	xxx
Volume of Fill	Cu.Yd.	259,000	295,000	554,000
Total Capacity 1/ Sediment	Ac.Ft.	206.3	282.2	488.5
Floodwater Retarding Between High and Low Stage	Ac.Ft.	96.0	143.0	239.0
	Ac.Ft.	110.3	139.2	249.5
	Ac.Ft.	93.6	121.8	215.4
Surface Area				
Sediment Pool	Acres	10.8	15.0	25.8
Floodwater Retarding Pool	Acres	15.1	22.4	37.5
Principal Spillway Design				
Rainfall Volume (1-day)	In.	2.45	2.45	xxx
Rainfall Volume (10-day)	In.	3.20	3.20	xxx
Runoff Volume (10-day)	In.	1.53	1.39	xxx
Capacity of Low Stage (Max.)	cfs	25.9	24.5	50.4
Capacity of High Stage (Max.)	cfs	71.6	61.0	132.6
Dimensions of Conduit	In.	30	30	xxx
Type of Conduit		R.C. pipe	R.C. pipe	xxx
Frequency Operation-Emerg. Spillway	% Chance	1.0	1.0	xxx
Emergency Spillway Hydrograph				
Rainfall Volume	In.	3.81	3.81	xxx
Runoff Volume	In.	2.37	2.29	xxx
Storm Duration	Hrs.	6	6	xxx
Velocity of Flow (Ve)	Ft./Sec.	6.33	5.7	xxx
Max. Reservoir Water Surface Elev.	Ft.	6074.2	6082.1	xxx
Freeboard Hydrograph				
Rainfall Volume	In.	9.24	9.24	xxx
Runoff Volume	In.	7.54	7.41	xxx
Storm Duration	Hrs.	6	6	xxx
Max. Reservoir Water Surface Elev.	Ft.	6078.8	6085.8	xxx
Discharge per Foot of Width (Oe/b)	Ac.Ft.	8.3	5.5	xxx
Bulk Length	Ft.	200+	200+	xxx
Capacity Equivalents				
Sediment Volume	In.	0.73	0.82	xxx
Floodwater Retarding Volume	In.	0.84	0.79	xxx

1/ Crest of Emergency Spillway

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TABLE 3A STRUCTURE DATA
CANAL LINING
SHAVANO VALLEY WATERSHED - MONTROSE COUNTY COLORADO

Canal System	Reinforced Concrete Lining (Ft)	Planned Canal Capacity (CFS)	Average Bottom Width (Ft)	Average Depth (In.)	Average Slope (Ft/Ft)	Average Canal Velocity	Average Concrete /100 L.F. (Cu. Yd)	Volume of Concrete (Cu. Yd.)
West Canal	2,000	50	4	25	0.007	8.1	11.0	220.0

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TABLE 4 - ANNUALIZED ADVERSE NEEDED EFFECTS
SHAVANO VALLEY WATERSHED, COLORADO

(Dollars) 1/

EVALUATION UNIT	PROJECT OUTLAYS		OTHER PROJECT COSTS	TOTAL
	Amortization of Installation Cost	Operation, Maintenance, and Replacement Cost 2/		
Evaluation Unit 1 Floodwater Retarding Dams	251,400	18,100	0	269,500

1/ Price Base December 1985, Discounted and annualized at 8 5/8 percent discount rate for 100 years.

2/ Includes \$7,000 for liability insurance.

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TABLE 5 - ESTIMATED ANNUALIZED FLOOD DAMAGE REDUCTION BENEFITS
SHAVANO VALLEY WATERSHED, COLORADO

(Dollars) 1/

Item	Estimated Annualized Damage		Damage Reduction Benefit
	Without Project	With Project	
Floodwater			
Crop and Pasture	431,900	126,200	305,700
Sedimentation	6,600	0	6,600
Other Agricultural	41,600	2,600	39,000
Nonagricultural			
Other	69,900	8,400	61,500
GRAND TOTAL	550,000	137,200	412,800

1/ Price Base December 1985

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TABLE 6 - COMPARISON OF NED BENEFITS AND COSTS
SHAVANO VALLEY WATERSHED, COLORADO

(Dollars) 1/

EVALUATION UNIT	AGRICULTURAL	NON- AGRICULTURAL		TOTAL ANNUALIZED BENEFITS	ANNUALIZED COSTS 2/	BENEFIT COST RATIO
	Damage Reduction FP					
Evaluation Unit 1 Floodwater Retarding Dams	351,300		61,500	412,800	269,500	1.53:1.0

1/ Price base December 1985

2/ From Table 4

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EFFECTS of RECOMMENDED PLAN

GENERAL

This section describes the economic, environmental, and social effects of the planned project.

EFFECTS

Table H displays the beneficial and adverse effects of the recommended plan by accounts: National Economic Development, Environmental Quality, and Other Social Effects.

National Economic Development (NED)

Average annual beneficial (NED) effects of \$412,800 were derived from: preventing flood and sediment damages to irrigated cropland and farmstead property; reduced interruption of irrigation water; reduced salinity damages; preventing loss of income from time used to fight floodwaters and clean up afterward; reduced damages to roads, bridges, and rural water systems; and from reducing losses incurred for emergency expense.

Adverse NED effects are the costs of installing the project. Average annual costs are estimated at \$269,500.

Net annual beneficial effects are estimated at \$143,300.

Benefit cost ratio is 1.53:1.0 based on current conditions and prices. No changes in watershed conditions, cropping patterns, or increases in the damage base or costs were considered.

Regional Economic Development benefits (RED)

Regional Economic Development benefits (RED) were considered the same as the (NED) effects since the county is not considered a low income or high unemployment area.

EFFECTS ON PROBLEMS AND OPPORTUNITIES

The PROBLEM AND OPPORTUNITY IDENTIFICATION section described flooding as the major problem in the watershed. Table H displays the degree to which the identified problems or opportunities are satisfied.

EFFECTS ON IDENTIFIED CONCERNS

The recommended plan addresses all concerns with a "high" or "medium" rating shown in Table D of the INVENTORY AND FORECASTING section. Table H displays effects on these concerns.

IRRETRIEVABLE RESOURCES

Labor, capital resources, and the energy used to install this project will be irretrievably committed.

TABLE H - EFFECTS OF THE RECOMMENDED PLAN
SHAVANO VALLEY WATERSHED, COLORADO

NATIONAL ECONOMIC DEVELOPMENT			
BENEFICIAL EFFECTS		ADVERSE EFFECTS	
Components	Measure of Effects (Average Annual) 1/	Components	Measure of Effects (Average Annual) 2/
A. Value to users of reduced flood	\$412,800	A. Value of Resource required for project: 1. Project installation 2. OM&R	 \$251,400 \$ 18,100
TOTAL BENEFICIAL EFFECTS:	\$412,800	TOTAL ADVERSE EFFECTS:	\$269,500
NET REMAINING BENEFITS:	\$143,300	B:C = 1.53:1.0	

1/ Price base December 1985

2/ Amortized over 100 years @ 8-5/8 percent interest.

TABLE H - EFFECTS OF THE RECOMMENDED PLAN (Continued - 2)
SHAVANO VALLEY WATERSHED, COLORADO

ENVIRONMENTAL QUALITY			
BENEFICIAL EFFECTS		ADVERSE EFFECTS	
<u>Components</u>	<u>Measure of Effects</u>	<u>Components</u>	<u>Measure of Effects</u>
A. Aesthetics	1. After-flood unsightliness from debris and sediment deposition will be reduced on 617 acres of flood plain.	A. Aesthetics	1. Structures will introduce new forms, textures, lines, and colors into the landscape.
B. Ecological Attributes	1. Protects 617 acres from overflow and 21,550 acres from aquatic interruption. 2. Improve quality of water flowing into Uncompahgre and Colorado Rivers by reducing sediment 5,800 tons/yr. and salt by 28 tons/yr. 3. Improve productivity on 250 acres of cropland by reducing sediment deposition and scour.	B. Ecological Attributes	1. Loss of use on 57 acres of rangeland and 1.7 acres of irrigated cropland.
C. Cultural Attributes	1. No significant sites found by detailed survey.	C. Cultural Attributes	1. No significant sites found by detailed survey.

TABLE H - EFFECTS OF THE RECOMMENDED PLAN (Continued - 3)
SHAVANO VALLEY WATERSHED, COLORADO

OTHER SOCIAL EFFECTS		
BENEFICIAL EFFECTS		ADVERSE EFFECTS
<u>Components</u>	<u>Measure of Effects</u>	<u>Components</u> <u>Measure of Effects</u>
A. Community Impacts	<ol style="list-style-type: none"> 1. Eliminates inconvenience and anxiety associated with flooding farmsteads. 2. 71% reduction of damages caused by interruption of irrigation water supply to 21,550 acres. 3. Flood damage losses to minorities, low-income, handicapped, and elderly will be reduced. 4. Eliminates broken water and telephone lines and anxiety associated with it. 5. Prime farmland protected (335 acres). 	<ol style="list-style-type: none"> 1. Energy, labor, and materials used in the construction of the project will be irretrievable. 2. 1.7 acres of prime farmland converted to structural site.
B. Life, Health, and Safety	<p>Reduces flooding associated:</p> <ol style="list-style-type: none"> 1. Risk to life from fast flows. 2. Risk to health and life from furnace drownouts, hot water systems, and electrical problems of farmsteads. 3. Risk to health from sewage contamination of domestic wells and breaking of rural water supply system. 4. Safety hazards and inconveniences associated with flood damage to 7 county, 1 state, and 5 private roads. 	<ol style="list-style-type: none"> 1. Dust, noise, and traffic will increase during construction.

TABLE I - EFFECTS OF THE RECOMMENDED PLAN ON RESOURCES
OF PRINCIPAL NATIONAL RECOGNITION

Type of Resource	Principal Source of National Recognition	Measurement of Effects
Air quality	Clean Air Act, as amended (42 U.S.C. 1857h-7, <u>et seq.</u>)	Immediate area will have reduced quality only during construction in the form of dust.
Areas of particular concern within the coastal zone	Coastal Zone Management Act of 1972, as amended (16 U.S.C. 1451, <u>et seq.</u>)	Not present in the planning area.
Endangered and threatened species critical habitat	Endangered Specied Act of 1973, as amended (16 U.S.C. 1531, <u>et seq.</u>)	Not present in the planning area. No adverse impact downstream.
Fish and wildlife habitat	Fish and Wildlife Coordination Act (16 U.S.C. 661, <u>et seq.</u>)	No significant effect. Reduced upland habitat quality on 21.2 acres of area disturbed.
Floodplains	Executive Order 11988, Floodplain Management.	Nearly eliminates 100-year storm event floodplain.
Historic and cultural properties	National Historic Preservation Act of 1966, as amended (16 U.S.C. 470, <u>et seq.</u>)	No eligible sites found by detailed survey.
Prime and unique farmland	CEQ Memorandum of August 1, 1980: Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing the National Environmental Policy Act. Farmland Protection Policy of 1981.	1.7 acres converted to structural site. Reduced flood damage to 335 acres.
Water quality	Clean Water Act of 1977 (33 U.S.C. 1251, <u>et seq.</u>)	5,800 tons of sediment and 28 tons of salt reduced annually.
Wetlands	Executive Order 11990, Protection of Wetlands Clean Water Act of 1977. (42 U.S.C. 1857h-7, <u>et seq.</u>)	No significant effect.
Wild and scenic rivers	Wild and Scenic Rivers Act, as amended (16 U.S.C. 1271, <u>et seq.</u>)	Not present in planning area.

RELATIONSHIP TO LAND AND WATER PLANS, POLICIES, AND CONTROLS

Appropriate clearinghouse procedures have been followed by the sponsors in processing the application for assistance

The District 10 Regional Planning Commission reviewed and approved the application, August 24, 1983 under PL-566. The notification of application was issued August 29, 1983 by the state clearinghouse, Department of Local Affairs, Colorado Division of Planning.

Gunnison River Basin Study (1962) listed the Shavano Valley as a potential project under the PL-566 program for flood control.

CONSULTATION and PUBLIC PARTICIPATION

Agency consultation and public participation were an integral part in all phases of planning and environmental evaluation conducted by the sponsors and SCS. All contacts were noted and the results reported and evaluated in the documentation.

AGENCY CONSULTATION

By August, 1982, several agencies had already participated with the sponsors and SCS to identify water and related land resource problems and related environmental considerations of the planning area. Based on the results of these meetings and preauthorization studies, SCS requested planning authorization from the SCS Chief in Washington, D.C. This authorization was granted March 26, 1984, and agencies and the public were notified. Formal agency consultation began with the July 26, 1983, notification by Shavano Soil Conservation District, Montrose Colorado Board of Commissioners, and Uncompaghere Valley Water Users Association to the Governor and the Colorado Division of Planning that they were applying for federal assistance under Public Law 83-566. This initiated the Project Notification and Review System required by the Office of Management and Budget.

Intensive planning and environmental evaluation began in September, 1983, under the direction of the SCS. An interdisciplinary team was formed to identify resource problems and related environmental considerations in the watershed. The team was comprised of federal, state, and local agency personnel, and private citizens representing local groups and organizations. A team meeting held on December 8, 1983, resulted in the identification of concerns listed in Table D.

Federal, state, and county agencies participated in the "scoping process" are described in the section, Inventory and Forecasting. The multidisciplinary planning staff and associated SCS specialists consulted with these agencies and group representatives on specific items as necessary, and periodically on an informational basis. The environmental evaluation required by the National Environmental Policy Act (NEPA) was conducted in conjunction with planning. A Finding of No Significant Impact will be issued to meet both federal NEPA and state requirements. Similar consultation continued throughout the environmental evaluation. Often one workshop, meeting, or contact served both planning and evaluation purposes.

The U.S. Fish and Wildlife Service (USFWS) was consulted June 6, 1985, in accordance with Section 7 of the Endangered Species Act, as amended, concerning threatened and endangered species that may be present in the Shavano Watershed. On August 5, 1985, the USFWS concurred with the SCS biological assessment that there would be "no effect" for the listed and candidate species and there would be no depletion of downstream water supplies attributable to the project. USFWS also participated, together with Colorado Division of Wildlife (CDOW), in the environmental evaluation.

In October, 1983, the State Historic Preservation Officer (SHPO) was consulted concerning historical and archeological sites within the Shavano Watershed. The SHPO indicated that there were no cultural properties registered on the National Register of Historic Places (NRHP); however, there were potential sites within the area on which eligibility for registration had not been established.

The Shavano Soil Conservation District contracted with a consultant to perform a cultural resource survey covering the project impact area. This survey indicated that there were five potential sites which should be investigated further to determine eligibility for registration.

These findings were reviewed with Bureau of Land Management personnel and it was determined that further investigation of these sites was necessary to determine their eligibility for inclusion in the NRHP. The detailed survey indicated that none of the five potential sites contained subsurface archeological features, stratigraphy, or other subsurface archeological remains. It was recommended that the project area be considered clear of significant and/or NRHP eligible cultural resources.

As per existing SCS policy, if previously undetected cultural resources are discovered during construction, work on the affected portion of the project will cease and further archeological evaluation will be done to determine the importance of the finding.

A Technical Review Plan-EA was distributed for an informal review to local agencies and to local offices of state and federal agencies and others who had participated. Discussions and informal comments on the technical review were incorporated into the Draft Plan-EA.

The Plan-EA is distributed for review and comment to individuals who had expressed interest in receiving a copy and to the agencies and groups shown on the following list:

U.S. GOVERNMENT

Department of Agriculture:

- Agricultural Stabilization and Conservation Service
- Extension Service
- Farmers Home Administration
- Forest Service

Department of Defense:

- Corps of Engineers

Department of the Interior:

- Bureau of Land Management
- Bureau of Reclamation
- Fish and Wildlife Service

Environmental Protection Agency
Advisory Council on Historic Preservation

STATE OF COLORADO

Office of the Governor
Department of Local Affairs, Colorado Division of Planning
Department of Agriculture
Department of Natural Resources
Water Conservation Board
Soil Conservation Board
Division of Water Resources
Colorado Heritage Center
State Forester
State Geologist
Division of Wildlife
Department of Highways

MONTROSE COUNTY

County Commissioners
County Planning Department
County Extension Service
County Committee, Agricultural Stabilization and Conservation Service

PUBLIC PARTICIPATION

A major consideration in the development of the Plan-EA was to provide interested and affected groups and individuals opportunity to participate. The sponsors and SCS developed a public participation program to achieve a high level of participation. Many individual contacts were made with residents in the project area and other interested persons to gather data and, most importantly, to solicit participation in planning and environmental evaluation.

A mailing list was prepared and maintained to ensure timely notification of meetings and distribution of materials.

Upcoming meetings and the availability of information were announced in newspaper notices and articles, media spots, posters, and at meetings of interested groups. Newspaper articles and media coverage also informed people of general progress during planning.

Public meetings were held beginning early in the preauthorization phase of planning with the public and interagency meeting held December 7, 1983. Participation was enthusiastic and opinions were expressed on various charts listing problems, opportunities, possible measures for alleviating problems or realizing opportunities, and the effects of those measures. Additional public meetings held on February 20, 1985, and April 24, 1985, presented the identified problems and opportunities and the alternative plans that were under consideration. NED, and Without Project plans were included in the plan proposals. A public meeting on July 30, 1985, reviewed the various alternatives and proposed alternatives.

Next, a Technical Review Copy of the Plan-EA was given informal local distribution. This preliminary version was circulated within SCS for technical review and, at the same time, copies were made available for interested groups, individuals, and local agencies (including local offices of federal agencies) for an informal review.

After revision, the Plan-EA was published as a Draft and officially distributed for formal interagency review. Public participation in this review was encouraged.

SUMMARY OF COMMENTS AND RESPONSES

Comments from the Draft review and editorial corrections were considered in preparing the Final Plan-EA. Comments received on the draft and the responses to those comments will be included in Appendix A.

LIST of PREPARERS

LIST OF PREPARERS AND THEIR QUALIFICATIONS
SHAVANO VALLEY WATERSHED, MONTEZOME COUNTY, COLORADO

Name	Title and Years in Present Job	Education/Degree(s)	Experience	Other License(s), etc.
<u>SCS Resource Planning Staff</u>				
Jim P. Thornton	Riverbasin/Watershed Planning Staff Leader, 10 yrs.	B.S., Agricultural Engineering, New Mexico State University	Agricultural Engineer, 8 yrs. Civil Engineer, 7 yrs. Staff Leader, 10 yrs.	P.E. Colorado P.E. New Mexico
Nyle Jordre	Agricultural Economist, 8 yrs.	B.S. & M.S., Agricultural Economist, North Dakota State University	Soil Conservationist, 1 yr. Agricultural Economist, 18 yrs.	
Eldie Mustard	Biologist, 22 yrs.	B.S. & M.S., Wildlife Management, Iowa State University and Colorado State University, respectively	Biologist, Iowa, 5 yrs. Biologist, Colorado, 22 yrs. w/SCS	Certified Wildlife Biologist
Glade Wilkes	Hydraulic Engineer, 13 yrs.	B.S., Civil Engineering, Utah State University	Student Training (Engineering), 4 yrs. Agricultural & Civil Engineer, 6 yrs. Hydraulics Engineer, 19 yrs.	
Carrol Hamon	State Conservation Agronomist, 4 yrs.	B.S. General Agronomy Colorado State University	Soil Scientist, SCS, 3 yrs. Soil Conservationist, SCS, 3 yrs. District Conservationist, SCS, 18 yrs. State Conservation Agronomist, 4 yrs.	Certified Pesticide Applicator
Robert Altstadt	Resource Conservationist, 9 yrs.	B.S., Agronomy, Colorado State University	Soil Conservationist, 5 yrs. District Conservationist, 10 yrs. Resource Conservationist, 9 yrs.	

Name	Title and Years in Present Job	Education/Degree(s)	Experience	Other License(s), etc.
<u>SCS Area Staff</u>				
Harry Smith	Planning Engineer, 12 yrs.	B.S., Agricultural Engineer, Texas Tech	Field Engineer, 9 yrs. Planning Engineer, 12 yrs.	P.E. Texas
Vaughn Brown	Agricultural Economist, 1 yr.	B.S. & M.S., Agricultural Economist, Colorado State University	Agricultural Economist	
Alex Elkin	Geologist, 20 yrs.	B.A., Geology, 1-1/2 yr. graduate work, Missouri University	Geologist, 35 yrs.	
Ed Neilson	Area Biologist, 6 yrs.	B.S., Wildlife Biology, Colorado State University	Biologist, 6 yrs.	
Don Tetsell	Retired (1985)	B.S., Agronomy, Colorado State University	Soil Scientist, 11 yrs. District Conservationist, 22 yrs.	
Ed Kubin	Retired (1984)	B.S., Civil Engineering, Montana State University	Field Engineer, 28 yrs. Field Engineer, 3 yrs., Grand Valley Salinity Project	
William Self	District Conservationist, 1 yr.	B.S., Range Ecology Colorado State University	Range Conservationist, 3 yrs. Soil Conservationist, 2 yrs. District Conservationist, 10 yrs.	

APPENDICES

APPENDIX A - Letters and Oral Comments on Draft Plan-EA

APPENDIX B - Support maps and figures

APPENDIX C - Project Map

MEMORANDUM

TO : THE SECRETARY OF DEFENSE

FROM : [illegible]

SUBJECT: [illegible]

[illegible text]

[illegible text]

[illegible text]

[illegible text]

APPENDIX A

LIST OF COMMENTS

<u>Comment Received</u>	<u>Page</u>
<u>U.S. GOVERNMENT</u>	
Department of Agriculture - Forest Service	A - 7
Department of the Army - Corps of Engineers	A - 7
Department of Interior - Bureau of Land Management	A - 2
Department of Interior - Bureau of Reclamation	A - 5
Department of Interior - Fish and Wildlife Service	A - 8
<u>STATE OF COLORADO</u>	
Department of Highways	A - 8
Department of Natural Resources - State Soil Conservation Board	A - 6



United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Montrose District Office
2465 South Townsend Avenue
Montrose, Colorado 81401

IN REPLY
REFER TO 2800 (161)

Sheldon G. Boone, State Conservationist
U.S. Department of Agriculture
Soil Conservation Service
2490 West 26th Avenue, Diamond Hill
Building A, Third Floor
Denver, Colorado 80211

Dear Mr. Boone:

Subject: Comments on Shavano Valley Watershed Plan and Draft Environmental Assessment, April, 1986

Parts of this proposal would be located on public lands. Authorization would have to be issued by this office and the associated impacts addressed before any surface disturbance occurs on public lands, including temporary or permanent inundation or siltation and removal of borrow material. We would also need to be assured that proper rehabilitation would occur. We feel that a more detailed discussion and analysis of the "No Project Action" (p.28) alternative and the "Land Treatment" alternative (p.24) is needed. More specific comments are included in the following paragraphs, with page references.

Project Setting:

Page 8 A discussion of the land uses that occur on BLM-managed land would be appropriate, including the areas proposed to be 1) inundated, 2) silted, 3) used for borrow material, and 4) construction sites.

Problem and Opportunity Identification:

Pages
12/13

Are local bridges affected by the flooding underdesigned?

Page 16

The statement is made that wildlife habitat can be improved in the watershed; this is true, but there is no indication of how, or what significant wildlife habitat benefits might occur.

Formulation of Alternatives:

Pages
24/25

Upstream land treatment (watershed management) on public land is dismissed rather lightly on pages 24 and 25. Have the sponsors absolutely determined that watershed improvements would not reduce runoff, or that watershed improvement is impossible? Investigations and conclusions to that effect should be documented here.

JUN 6 1986

Mr. Paul W. Arrasmith
District Manager
U.S. Bureau of Land Management
Montrose District Office
2465 South Townsend Avenue
Montrose, Colorado 81401

Dear Mr. Arrasmith:

Thank you for your comments on the Draft Watershed Plan and Environmental Assessment, Shavano Valley Watershed, Montrose County, Colorado.

The watershed sponsors are aware that they must, as a part of their responsibility, secure all needed landrights and obtain a permit from the Bureau of Land Management. The discussion of the "No Project Action" and "Land Treatment" alternatives was revised.

Your specific comments are addressed as follows:

Project Setting

A statement was added to show that all of the BLM-managed lands are used as pasture or rangeland.

Problem and Opportunity Identification

The local bridges are designed to pass a flow of approximately a 10-year frequency. Montrose County determines whether this is a correct design.

The statement on page 16 indicates that there is an opportunity to improve riparian wildlife habitat. The "Effects of Recommended Plan" section (Table H) discusses the actual benefits of the proposed plan. The title of Table H is changed to "Effects of the Recommended Plan."

RESPONSE

UNITED STATES
DEPARTMENT OF
AGRICULTURE

SOIL
CONSERVATION
SERVICE

2490 WEST 26TH AVENUE
DENVER, COLORADO 80211

June 23, 1986

RESPONSE

2

Page 29 There is a statement that wetland riparian habitat would be improved
Table F if the proposed action were implemented, but it is unclear how that would take place. Methods to improve riparian habitat would be to insure that the carrying capacity of the natural channels is retained and riparian vegetation is maintained in healthy condition. (Row crops are not riparian vegetation). The document would benefit by having this and similar information backing up conclusions included. Under the No Action alternative, it is indicated that upland, wetland, and riparian habitat would continue to degrade. What is the riparian habitat on the downstream areas? A discussion of degradation from flood damage to these resources would be helpful. Also, a comparison of degradation from flood damage and human occupation and use in the floodplain would be helpful in order to demonstrate the actual causes and sources of degradation. Wildlife habitat on public land upstream from the proposed project would not be severely degraded.

Recommended Plan:

Page 32 What do the sponsors propose to do when these large structures have passed their useful life? The quantity of sediment trapped within the impoundments would be so great that cleaning and disposal seems unfeasible. Once the structures are silted in, the landowners would be right back to where they are now. After a hundred years of flood control, there would most certainly be more structures, roads, etc. in the downstream floodplain. Given that residents have located in the floodplain when it is being flooded regularly, they would probably construct more in this floodplain if they felt secure from floods. The rate of siltation should be included in this section or in the Effects of Recommended Plan section (p.58).

Page 34 Authorization would be needed from BLM to use public lands for this project or to inundate public land. The necessity for this authorization should be mentioned on p.39 under Permits. Discuss rehabilitation and how the proposal would impact public lands including impacts from inundation (temporary or permanent), siltation, and borrow areas.

Page 36 Would an archaeologist be on the site during soil-disturbing activities? The BLM normally requires this for surface-disturbing projects. Has an archaeological survey been done for the area proposed to be inundated, and at the proposed borrow sites? If not, BLM would normally require that SHPO and BLM concurrence be obtained (for mitigation of any sites found) before surface-disturbing activities begin. Please also discuss this.

Page 39 Discuss mitigation proposed for impacts on BLM-managed land.

Effects of Recommended Plan:

The possibility of loss to livestock, wildlife, and human life has not surfaced as an effect. If the proposal would result in deep water being stored in the reservoir, this possibility should be

Formulation of Alternatives

The discussion of a land-treatment-only project indicates that range improvement would have limited effect. It would take a long time to obtain and would not solve the present flooding problems of the watershed. The narrative on page 25, second sentence, was changed by adding the statement, "However, there would be a reduction in erosion over the upland watershed and a reduction in sediment delivered."

Explanation of riparian habitat improvement for Table F will be found on page 28. It was revised to indicate that wetland/riparian habitat would be improved along Coal Creek by reducing the bank erosion and sedimentation in the channel.

The "No Project Action" alternative description was revised to indicate that the information contained in the "Problem and Opportunity Identification" and "Inventory and Forecasting" sections applies to this alternative.

Recommended Plan

The project will obtain all of the claimed benefits within the project life. After this time, additional project actions can be investigated. Table H shows that sediment will be reduced by 5,800 tons/year to the Uncompahgre River. Table 3 displays the structural data for including the rate of siltation. The "Permits and Compliance" section was revised to indicate that a right-of-way grant would be needed from the Bureau of Land Management.

The archaeological survey completed during the planning process covered all planned disturbed and/or inundated areas. The Colorado SHPO has concurred in the finding from this survey. The contract proposal was sent to your Cultural Resources Specialist on August 14, 1985 for review and comment. The detailed archaeological and historic survey report was sent to your Cultural Resources Specialist on March 3, 1986 for review and comment. As stated on page 34, all disturbed areas will be revegetated; therefore, we see no long-term negative impacts to BLM-managed lands which would require additional mitigation. The "Mitigation Features" section on page 39 will state that the right-of-way grant will address any mitigation required by your agency.

RESPONSE

- 3 -

Effects of Recommended Plan

The structures are designed as "dry dams." At least 85 percent of the stored water will be evacuated within 10 days. Therefore, no deep pools of water will exist over an extended period of time. The "risk to life" refers to the conditions downstream from the structure. The narrative was changed on pages 1, 30 and 32.


Appendix B, the "Topographic Map of Reservoir and Dam Sites," will be revised to show the area inundated. It also shows BLM land boundaries.

Appendix C. The symbols used on the project map are standard for all PL-566 projects. We believe that the detail map in Appendix B will adequately show the area inundated.

Finding of No Significant Impact (FONSI)

The table in the FONSI is identical to Table H shown in the Watershed Plan and Environmental Assessment. The cultural attributes were considered in the archaeological study report, as previously discussed.

Sincerely,


Sheldon G. Moore
State Conservationist

3

discussed. This discussion is especially relevant in light of the statement in the "Finding of No Significant Impact" which reads: "The structures are classified as high hazard dams (Class C) due to the risk to life".

Appendix B:

Show BLM land boundaries on the reproduction of the USGS 7½' map that depicts the project. The two maps do not agree. Which is correct? Also, please show and label the area to be inundated.

Appendix C:

Please show the maximum area to be inundated.

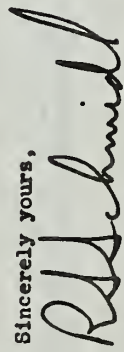
Finding of No Significant Impact (FONSI):

The table in the FONSI mentions benefits such as reduced flooding associated with risk to life and health (E) from fast flows, furnace drownouts, hot water systems, and electrical problems on farmsteads. The FONSI is normally a summary of already introduced data, in which case a discussion of these items should appear in the EA.

The adverse effects to cultural attributes could change if sites are found in the area on public land to be inundated or otherwise impacted. Under Alternatives, please refer to our comment above, referencing p.24/25 under Formulation of Alternatives

Please contact Bill Bottomly at 249-7791, Ext. 317 in the Uncompahgre Basin Resource Area office if you have questions or wish more information. Our office hours are from 7:45 a.m. to 4:30 p.m.

Sincerely yours,


for Paul W. Arrasmith
District Manager



United States Department of the Interior
BUREAU OF RECLAMATION

UPPER COLORADO REGION
GRAND JUNCTION PROJECTS OFFICE
P.O. BOX 1889
GRAND JUNCTION, COLORADO 81502

REPLY TO GJ-450
120.1

MAY 2 1986

Mr. Sheldon G. Boone
State Conservationist, Soil
Conservation Service, USDA
Diamond Hill, Bldg. A, 3rd Floor
2490 West 26 Avenue
Denver, Colorado 80211

Dear Mr. Boone:

We have reviewed the Draft Watershed Plan and Environmental Assessment for the Shavano Valley Watershed, Montrose County, Colorado, and have the following comments.

- 1) If the present alignment of the canal is changed, Reclamation will require a new deeded right-of-way for the relocated portion of the canal.
- 2) Because Reclamation has the responsibility to assure that the irrigation facilities of the Uncompahgre Project are constructed, operated, and maintained in a safe and proper manner, we need to review and approve the design and specifications for the proposed changes to the West Canal. The UFWUA will continue to operate and maintain the project facilities.
- 3) Before any modification or relocation takes place, an agreement to relocate and modify the canal must be obtained from the Bureau of Reclamation. Completion of this agreement will cover items 1 and 2 above.

Thanks for the opportunity to review the watershed plan for the Shavano area.

Sincerely yours,

Walter E. Fite
Projects Manager

RESPONSE

UNITED STATES
DEPARTMENT OF
AGRICULTURE

SOIL
CONSERVATION
SERVICE

2490 WEST 26TH AVENUE
DENVER, COLORADO 80211

June 23, 1986

Mr. Walter E. Fite
Projects Manager
Grand Junction Projects Office
U.S. Bureau of Reclamation
P.O. Box 1889
Grand Junction, Colorado 81502

Dear Mr. Fite:

Thank you for your comments on the Draft Watershed Plan and Environmental Assessment for the Shavano Valley Watershed, Montrose County, Colorado. In response to those comments, the "Permits and Compliance" section was rewritten to include the following sentence:

"An agreement to relocate and modify the West Canal will be completed by the sponsors and the USDI, Bureau of Reclamation, before construction begins."

Sincerely,

Sheldon G. Boone
State Conservationist



Richard D. Lamm
Governor

COLORADO DEPARTMENT OF NATURAL RESOURCES
STATE SOIL CONSERVATION BOARD
STEVEN W. HORN, Ph.D., Director



May 2, 1986

Mr. Sheldon G. Boone
State Conservationist
USDA Soil Conservation Service
2490 West 26th Avenue, Building A
Denver, Colorado 80211

Dear Sheldon,

The Colorado State Soil Conservation Board has reviewed the Draft Watershed Plan and Environmental Assessment for the Shavano Valley Watershed Project. The CSSCB has had representation at all public planning meetings and have made comments at those times.

We support Alternative 2, which would consist of two single-purpose floodwater retarding structures. This alternative has thoroughly addressed concerns which surfaced at the public meetings as well as accomplishing the goals of the sponsors. The cost-benefit ratio is good. Benefits to off-site water quality, wildlife, and water users are also great.

Recreational development is not an objective of the project. Access to the structures would be primarily through private land. We have found that maintenance costs increase and structural dependability and safety decrease on similar projects where public access is granted. The CSSCB encourages that public access to the structures be limited.

Sediment loading will be a maintenance cost to the sponsors and loading rates will be somewhat dependent upon land use practices on upstream lands. The CSSCB recommends that the Bureau of Land Management consider sediment yield when making land use decisions and manage these lands to minimize sediment yield.

Thank you for this opportunity to share our views on this project. We would like to see the Shavano Project proceed as quickly as possible. The benefits it will provide the resources of Colorado and its people as well as downstream users should not be delayed.

Sincerely,

Steven W. Horn
Steven W. Horn
Director

SMH/vaw

RESPONSE

UNITED STATES
DEPARTMENT OF
AGRICULTURE

SOIL
CONSERVATION
SERVICE

2490 WEST 26TH AVENUE
DENVER, COLORADO 80211

June 23, 1986

Dr. Steven W. Horn
Director
Colorado Soil Conservation Board
814 Centennial Building
1313 Sherman Street
Denver, Colorado 80203

Dear Steve:

Thank you for your comments on the Draft Watershed Plan and Environmental Assessment for the Shavano Valley Watershed, Montrose County, Colorado.

Public access to the project features is not provided for in the plan. The sponsors, as owners of the project, determine who has access to it.

The Bureau of Land Management prepares "Resource Management Plans," which guide their land use decisions. These plans address erosion and sediment as well as other environmental factors.

Sincerely,

Sheldon G. Boone
Sheldon G. Boone
State Conservationist

NOTE: THE FOLLOWING COMMENTS DID NOT REQUIRE A RESPONSE.



DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
680 CAPITOL MALL
SACRAMENTO, CALIFORNIA 95814

REPLY TO
ATTENTION OF

June 2, 1986

Regulatory Section

Dr

Mr. Sheldon G. Boone
State Conservationist
Soil Conservation Service
Diamond Hill, Building A, 3rd Floor
2490 West 26th Avenue
Denver, Colorado 80211

Dear Mr. Boone:

We have reviewed the draft Watershed Plan and Environmental Assessment (Plan/EA) for the Shavano Valley Watershed, Montrose County, Colorado.

The potential action does not conflict with Corps of Engineers responsibilities for flood control, navigation, or other water resource developments in the area.

We are in concurrence with the information disclosed in the Plan/EA and we have determined that a Department of the Army Permit will not be required for the proposed project.

Thank you for the opportunity to review and comment on the Plan/EA. If you have any questions, please contact Mr. Ken Jacobson in our Grand Junction Office at telephone (303) 243-1199.

Sincerely,

Art Champ

Art Champ
Chief, Regulatory Section



United States
Department of
Agriculture

Forest
Service

Rocky
Mountain
Region

11177 W. 8th Avenue
Box 25127
Lakewood, CO 80225

Reply to: 3510

Date: June 2, 1986

Sheldon G. Boone, State Conservationist
Soil Conservation Service
Diamond Hill, Bldg. A, 3rd Floor
2490 West 26th Avenue
Denver, CO 80211

Dear Mr. Boone:

We have reviewed the draft PL-566 Watershed Plan for Shavano Valley. On-going forestry and fire control programs for private lands will continue to be adequate. No National Forest lands are involved.

It appears to be a good project. Thank you for the draft copy.

Charles J. Hendricks

CHARLES J. HENDRICKS
Director, Watershed, Soils, and
Minerals Area Management

CAO:ls

NOTE: THE FOLLOWING COMMENTS DID NOT REQUIRE A RESPONSE.

STATE OF COLORADO

DEPARTMENT OF HIGHWAYS

4201 East Arkansas Ave.
Denver, Colorado 80222
(303) 757-8011



April 23, 1986

Mr. Sheldon G. Boone
State Conservationist
Diamond Hill Bldg. A, 3rd Floor
Soil Conservation Service
2490 West 26th Avenue
Denver, CO 80211

Dear Mr. Boone:

We have reviewed the Draft Watershed Plan and Environmental Assessment for the Shavano Valley Watershed in Montrose County and have the following comments.

The proposed flood control project will have no adverse effects on either State Highway 90 or State Highway 348. The project may benefit this Department by reducing peak flood flows on Dry Creek which crosses S.H. 348 approximately 12 miles downstream of the project.

We, therefore, have no objections to the project or the conclusion stated in the Draft Finding of No Significant Impact (FONSI).

Very truly yours,

Robert H. Clevenger
R. L. CLEVINGER
Chief Engineer



United States Department of the Interior

FISH AND WILDLIFE SERVICE
COLORADO FIELD OFFICE
730 SIMMS STREET
ROOM 292

GOLDEN, COLORADO 80401

IN REPLY REFER TO:

May 20, 1986

State Conservationist
Soil Conservation Service
Diamond Hill, Bldg. A, 3rd Floor
2490 West 26th Avenue
Denver, Colorado 80211

RE: Draft Watershed Plan and Environmental Assessment (Plan/EA)
for the Shavano Valley Watershed, Montrose County, Colorado

Dear Sir:

In response to your letter of April 16, 1986, the U.S. Fish and Wildlife Service (FWS) has reviewed the Draft Watershed Plan and Environmental Assessment for the Shavano Valley Watershed. Our review of the draft EA did not reveal any significant project impacts to fish and wildlife resources. FWS, therefore, has no objections to the project as presented.

FWS appreciates the opportunity to review and comment on this project. Should further assistance be required, please contact Mr. Bill Noonan of our Grand Junction Office (303/243-2778).

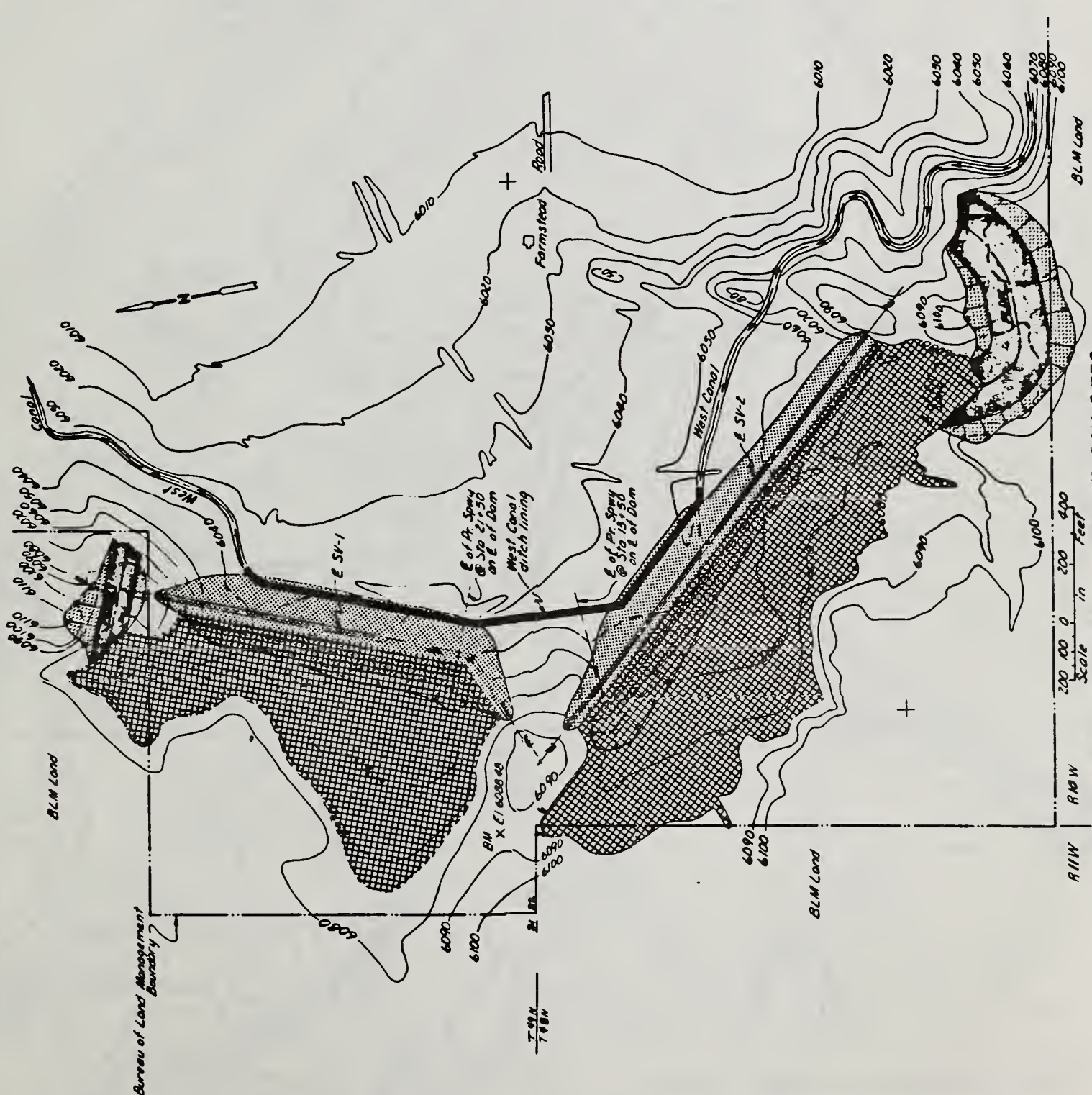
Sincerely,

L. Paul Finley
Asst. Field Supervisor
Ecological Services
ACTING

cc: FWS/HR, Denver, CO
FWS/HR, SLC, Grand Junction

APPENDIX B

W. B. E. 100



LEGEND

WESTERN-DITCH LINING

RESERVOIR AREA

CUT AREA FOR EMERGENCY SPILLWAY

DAM-FILL

FLOODWATER RETARDING STRUCTURES
SV-1 AND SV-2
SHAWANO VALLEY WATERSHED
Montrose County, Colorado
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Scale in Feet
200 00 0 200 400

TOPOGRAPHIC MAP OF RESERVOIR AND DAM SITES

Bureau of Land Management
Boundary

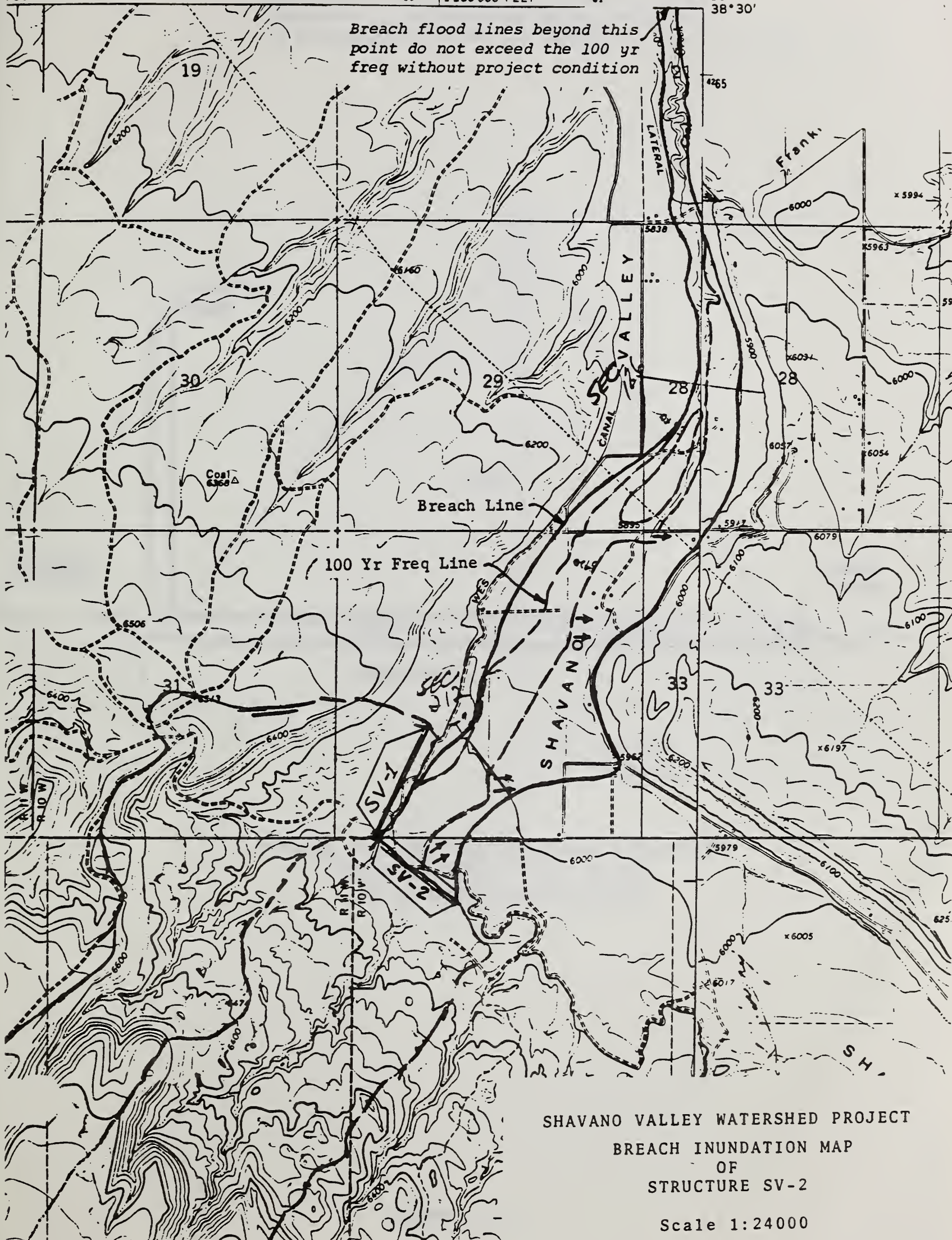
BLM Land

BLM Land

BLM Land

T-48N
7-48W

Breach flood lines beyond this point do not exceed the 100 yr freq without project condition



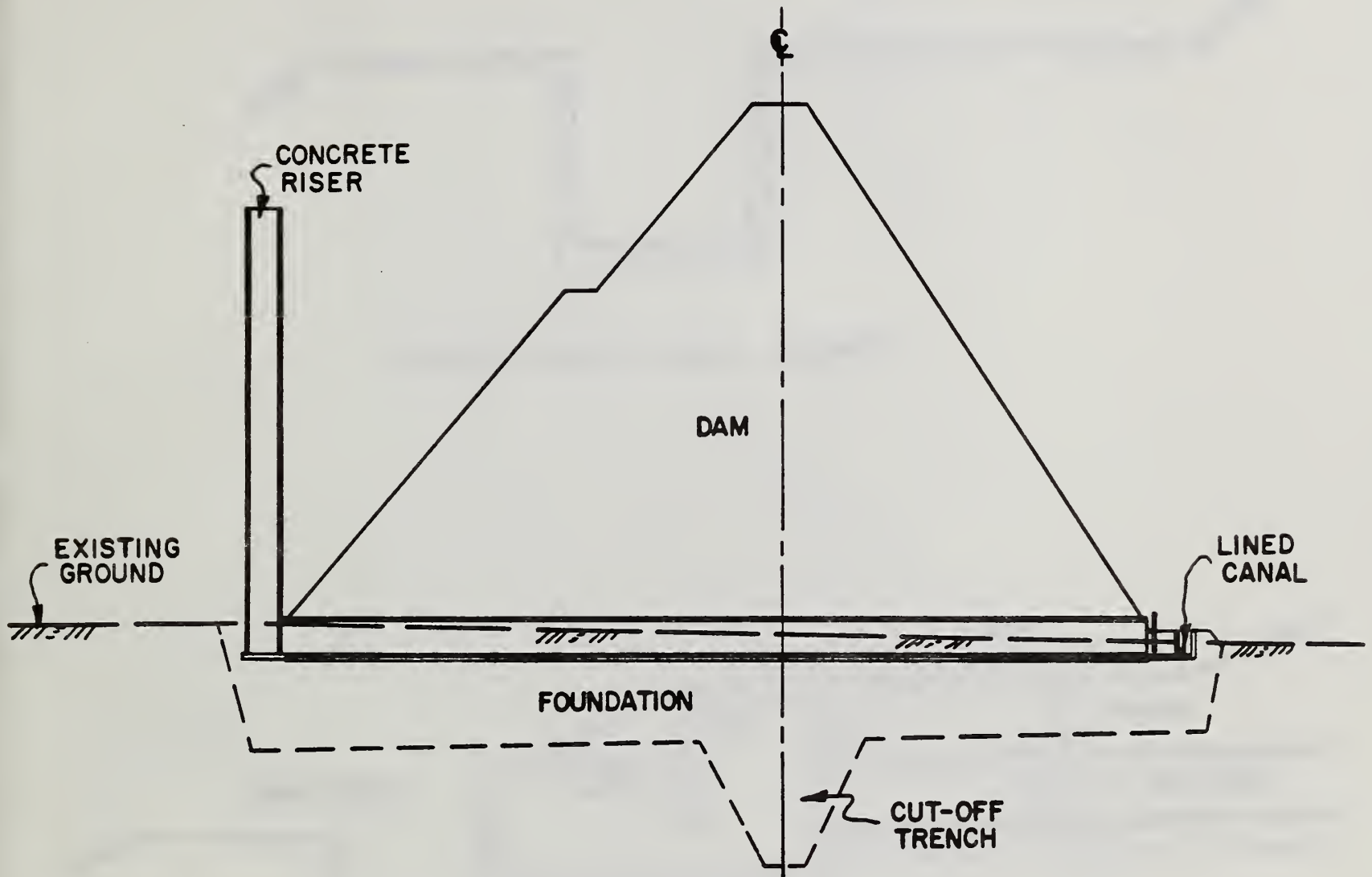
SHAVANO VALLEY WATERSHED PROJECT
BREACH INUNDATION MAP
OF
STRUCTURE SV-2

Scale 1:24000



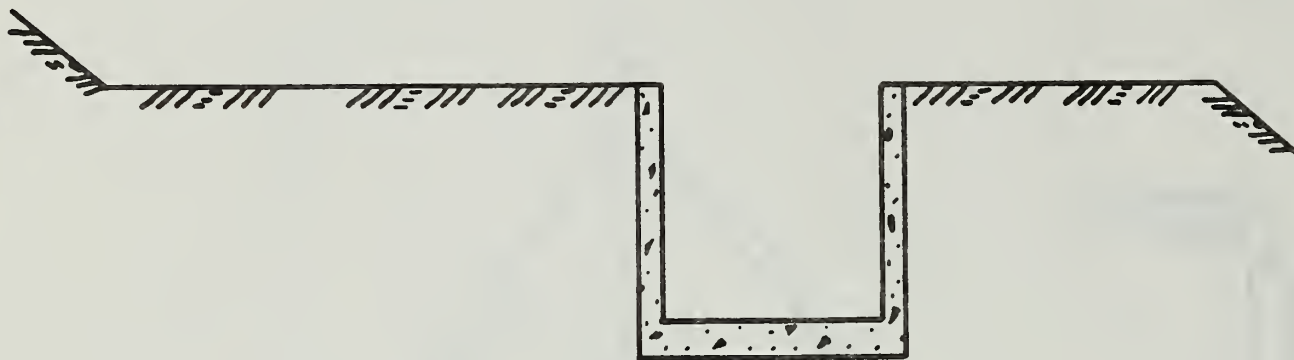
NOTE:

EMBANKMENT SIDE SLOPES, SIZE AND LOCATION OF BERMS,
ZONING OF FILL, AND FOUNDATION DRAINAGE NEEDS WILL
BE DETERMINED AT TIME OF FINAL DESIGN.

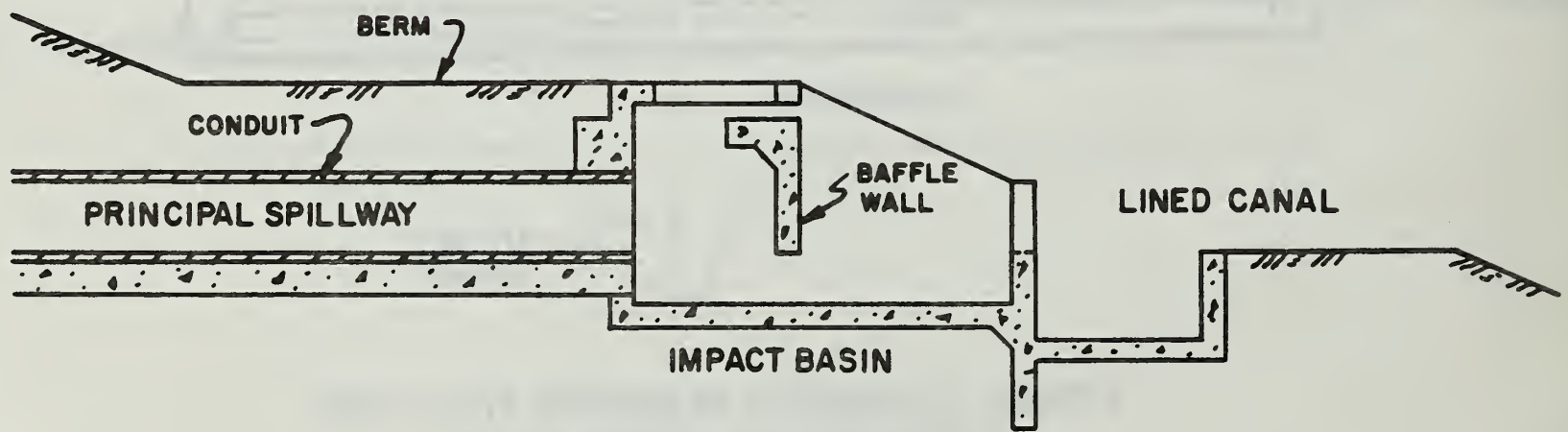


**TYPICAL FLOODWATER RETARDING STRUCTURE
CROSS SECTION OF DAM ALONG
C OF PRINCIPAL SPILLWAY**

FIGURE 1



TYPICAL LINED CANAL SECTION

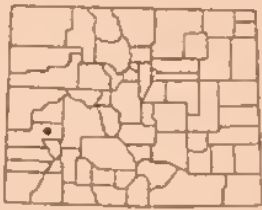


TYPICAL OUTLET STRUCTURE

APPENDIX C

5. EIGENSTADT





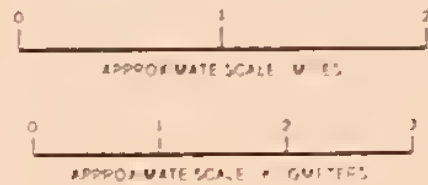
VICINITY MAP



- LEGEND
- IMPROVED ROAD
 - STATE HIGHWAY
 - WATERSHED BOUNDARY
 - PRIVATE LAND
 - BLM LAND
 - STABILIZATION STRUCTURE
 - DRAINAGE AREA CONTROLLED BY STRUCTURE
 - AREA BENEFITED
 - EVALUATION REACHES



PROJECT MAP
SHAVANO VALLEY WATERSHED
MONTROSE COUNTY, COLORADO





R0001 101095